# ELECTRICAL TIMES

THURSDAY, FEB. 23, 1950

VOL. 117 No. 3042 EST. 1891

6D



## *Successful Candidates*

In the new House of Commons the wiring for the Temperature Control Apparatus for the Air Conditioning Systems* is being carried out by :—

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154, ALBANY STREET, LONDON. N.W.1

who voted for

BY APPOINTMENT ELECTRIC CABLE MANUFACTURERS

**HENLEY CABLES**

*Supplied and installed by Messrs. Benham & Sons, Ltd., using Watford Electric and Negretti & Zambra Instruments.

Consulting Engineer :
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We have extensive experience in the machining of our own electrical insulating materials. The group shows some of our work on

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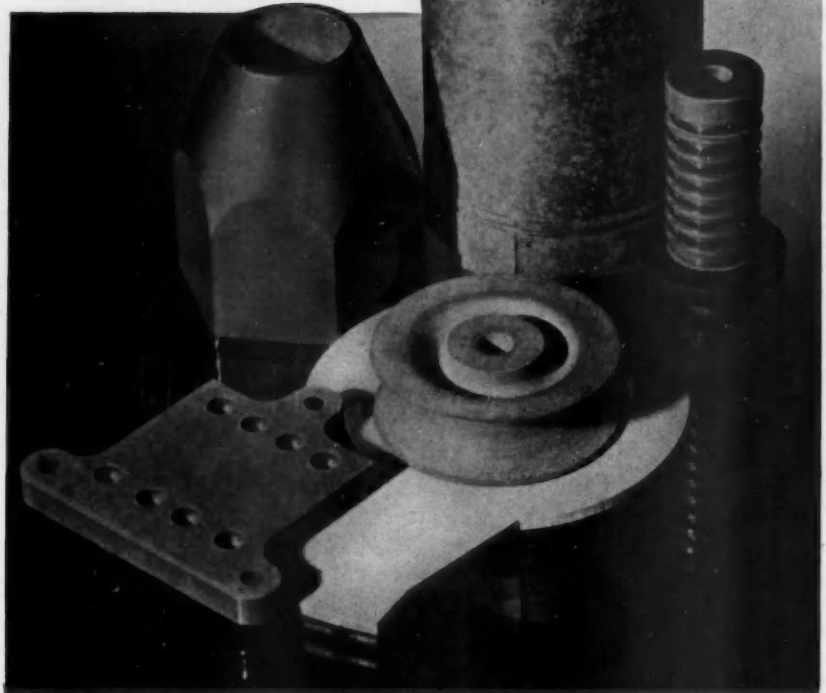

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THE MICANITE & INSULATORS CO. LTD.
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Manufacturers of MICANITE (Built-up Mica Insulation). Fabricated and Processed MICA. PAXOLIN Laminated Materials. PANILAX Laminated Materials and Mouldings. EMPIRE Varnished Insulating Cloths and Tapes. HIGH VOLTAGE BUSHINGS and TERMINALS. Distributors of Micoflex-Duratube Sleeving and Micoflex-Duresleeve (Plastics-covered flexible metal conduit)

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A number of transformers are being built by the Company for operation at 220kV and higher voltages for service in various parts of the world,

INCLUDING A 120,000kVA, 275kV, 3-PHASE UNIT FOR THE BRITISH ELECTRICITY AUTHORITY

*The illustration shows an artist's impression of an outstanding Transformer installation, now in process of manufacture, having the following characteristics:—*

**90,000kVA bank of single-phase units.**
**Separate windings for service at 220kV, 115kV & 38kV.**
**Provision for in-phase voltage regulation and phase-angle regulation on the 115kV winding.**

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TRANSFORMER DEPARTMENT · · STAFFORD

Works: STAFFORD · PRESTON · RUGBY · BRADFORD · LIVERPOOL

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CASTINGS
The technique of modern Pressure Die Casting enables work of an intricate nature to be reproduced with an accuracy equal to that of best workshop practice, but at a saving in time, labour and "spoils" that invites your earnest investigation.
Among examples we show here a FHP geared motor in which the carcase, end plates and gear case are pressure die cast in Zinc Base Alloy within an exacting tolerance specification and at a rate of several hundreds daily. May we explain how we can serve your needs also?
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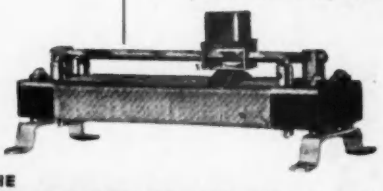
- We shall be glad to co-operate in their solution and to suggest suitable Apparatus. CRESSALL Resistances incorporate the soundest electrical and mechanical principles in design—yet prices are competitive.



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15 AMPERE 3 PIN INSULATED AND IRONCLAD.
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ROBUST, NEAT AND INCORPORATING AN ENTIRELY NEW METHOD OF CONTACT.

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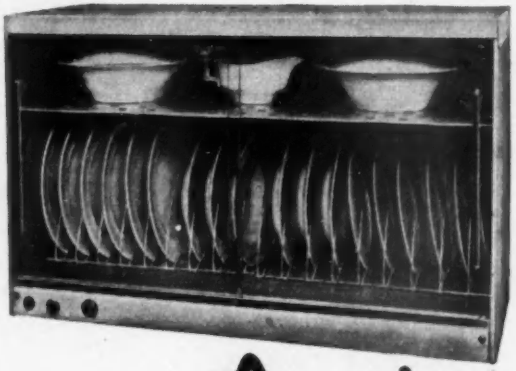
**Belling 47AB Cooker** with Automatic Oven Control, Patent Inner Glass Oven Door. White enamel with black hob £28 17s. 6d. (Cream and black 10/- extra). Simmerstats, Radiant Plate, Utensil Drawer to order.

**Princess Fire.**—An electric fire with a realistic burning coal effect. Finished in Ripple Silver, Ripple Bronze or Ripple Green.
List No. 212. 2 kw. £8. List No. 213. 3 kw. £9 5s.

**Plate Warming Cabinet,** fitted with sliding armour plate glass doors, warms food, about 18 dinner plates, several vegetable dishes, etc. Quickly dries plates after washing. Finished in white enamel. List No. 106. £13 5s. (Cream 5/- extra.)



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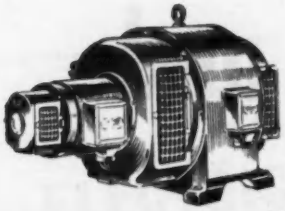
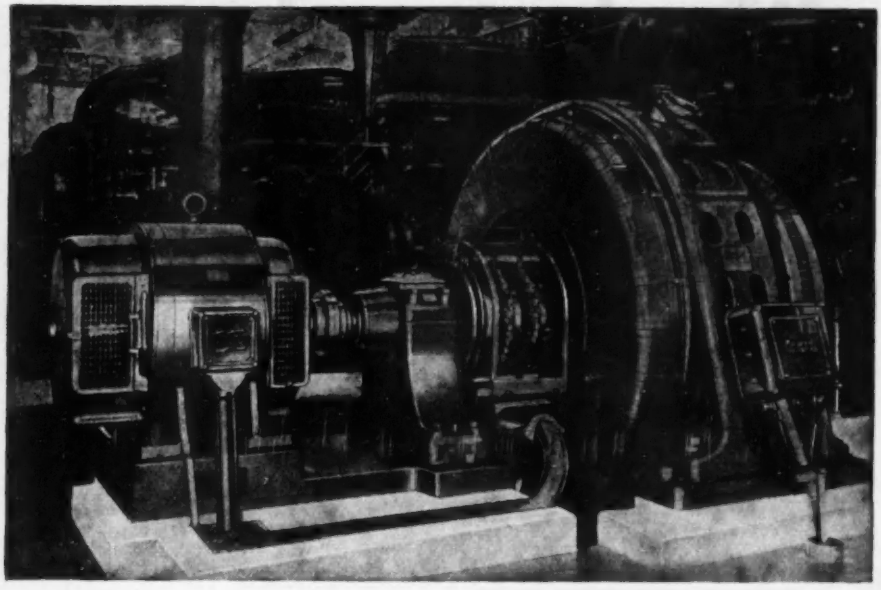


# Make your next motor earn you money



Is your next motor going to make your overall power factor better or worse? It is for you to decide! Make it a Crompton Parkinson Auto-synchronous motor and you have a fine motor plus a power factor corrector all in one. It has a high efficiency. It requires no more starting equipment than is needed for a slip-ring motor. And you have all the benefits of a good power factor.

**AUTO-SYNCHRONOUS MOTORS**

*ONE OF THE PRODUCTS OF THE PLANT DIVISION*

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LIMITED

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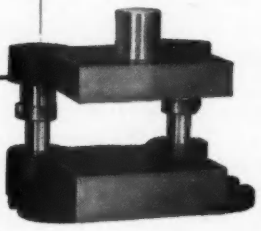

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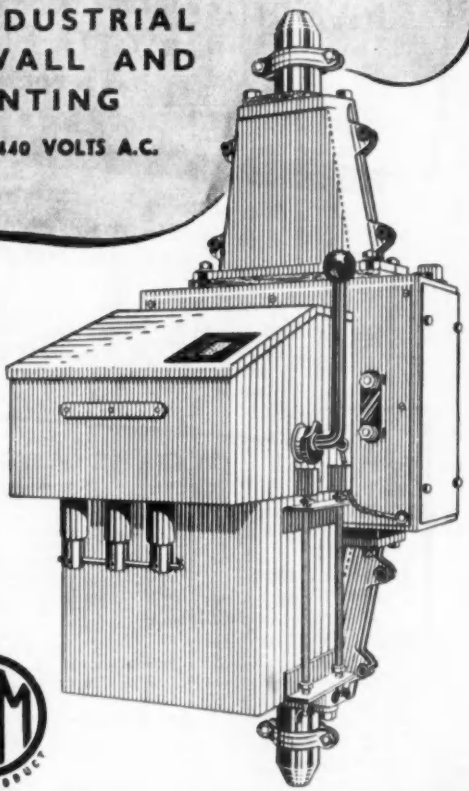
**TYPE TESTED INDUSTRIAL PATTERN FOR WALL AND FLOOR MOUNTING**

**RANGE 100 to 600 AMPS. 440 VOLTS A.C.**



Type F.D.2 Pattern B. 300 amp. Wall-Mounting Oil Circuit Breaker, complete with connection chamber, neutral link, also outgoing and incoming cable boxes.

*Available for prompt delivery, often ex-stock.*

Write for leaflet O.C.B. 102.

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Do your circuits operate in high temperatures? Do you face continuous renewal of cables and wires that have had the life baked out of them?

For "hot-spots" like these, B.I.C.C. can now provide Silicone Rubber Insulated Cables and Flexibles. Silicone Rubber is designed to provide reliable, stable insulation in unusually high temperatures. It remains flexible and does not bake, crack or flow. Silicone rubber insulating tubing can also be offered.

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Boiler gauge light connections. Thermo-couple leads. Connections for rheostats, furnaces, flue motors, electric ranges, stoves, electronic equipment and commercial radio apparatus. Turbo-jet engine leads. Film projector connections. Insulating sleeves for radio.

*Write for Publication No. 261W.*

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HOUSE SERVICE

# METER TYPE 23

ALL-INSULATED

COMPLIES WITH
B.S.S. 37/1937
and amendment
No. 1. JUNE, 1946

Approved by the
MINISTRY OF FUEL & POWER

*For full details see*
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**SIEMENS ELECTRIC LAMPS AND SUPPLIES LIMITED, 38/39 Upper Thames Street, London, E.C.4**
*Belfast, Birmingham, Bristol, Cardiff, Dublin, Glasgow, Leeds, Liverpool, Manchester, Newcastle, Nottingham, Sheffield*

# The B.N.E. model C.49

*The Cooker that has Everything*

★ PLANNED TO GIVE THE LAST INCH OF SPACE

In few places is space more valuable than in the modern kitchen, but that given to a C.49 is really put to good purpose. Built to conform to B.S.1195 dimensions, it has in addition to a very large oven, a capacious hot-cupboard and a drawer for storing the cooking utensils. The drawer unit is optional, but most of your customers will want it.

The way every inch of space is used is typical of the planning of the B.N.E. C.49—in every way it is an exceptionally good cooker. And delivery times are short, too!

★ COMMODIOUS HOT-CUPBOARD FOR KEEPING FOOD HOT AND WARMING PLATES.

★ DRAWER-UNIT (OPTIONAL) TO HOLD COOKING UTENSILS.

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*Another Valuable Contribution*

*by* THE SIGN OF 50 YEARS SERVICE

**NEW**

**S·P·3 HEAT COOKER SWITCH**

A.C. ONLY

This Switch sets the standard in dependability, design and size. It has a minimum rated capacity of 15 amps. 250 volts, can be supplied for various circuits and for rear or side wiring. Approximate dimensions are 1⅞in. square and 1⅜ in. in overall depth.

1 A.C. SERIES

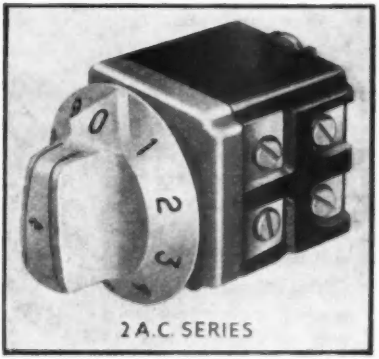
**NEW**

**D·P·3 to 9 HEAT COOKER SWITCH**

A.C. ONLY

The multiple double pole type has an overall depth of approximately 2¼in. and is available in a great variety of multi-circuit combinations. The illustration shows the well-known 9 heat Switch already in use. 7, 5, 4 or 3 heat circuits are also available.

REG. DESIGN & PATS. APPD. FOR




2 A.C. SERIES

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# EARTHOMETER TESTER is New Safety Factor

## MEGGER INSTRUMENT MEASURES IMPEDANCE OF COMPLETE EARTHING CIRCUIT

OFFICIAL REGULATIONS lay particular stress on the need for efficient earthing of electrical plant both at sub-stations and at consumer's premises. One of the functions of earthing is to allow sufficient current to pass in the event of an earth fault for the protective gear to operate.

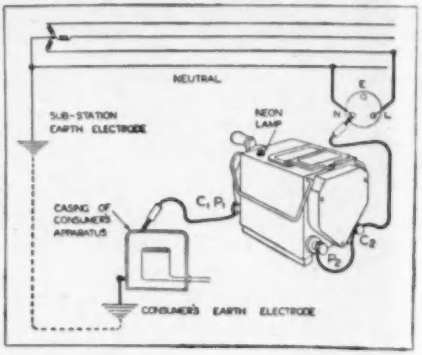
For this, the impedance of the *complete* earthing circuit must be sufficiently low to suit the requirements of each installation. This impedance can now be measured very simply by a Megger Earthometer Tester.

The Earthometer Tester is similar in construction and operating principle to the Megger Earth Tester. The "Earthometer" tests are carried out with the circuit alive, however, the instrument containing a live line detector in the form of a neon lamp. A press button switch short circuits the lamp while a measurement is being made.

The Megger Earthometer Tester makes possible a new and important safety factor in electrical installation. Full details of its construction and operation are given in List No. 233a, and Pocket Book No. 202/2, both available free.

*EVERSHED*

PROCESS CONTROLLERS
INDICATORS & RECORDERS
REMOTE CONTROLLERS
MEGGER TESTERS




## PLEASE — *I'm registered!*

No need to introduce myself. I'm a Megger. Every electrician knows me.

That's half the trouble. You all know me so well, wouldn't be without me, most of you—that some of you are inclined to forget who I really am.

It is nice being popular, and I don't want to stand on my dignity with friends. But the Law doesn't like me being taken so much for granted.

The Law recognises me as a registered Trade Mark. It says my name must only be used for the products of Evershed and Vignoles. That suits me—they're probably the best, anyway. The Law even says I'm an adjective, and mustn't be used as a noun.

So *please* remember that I'm not just a "Megger," but very definitely a "Megger this-or-that Tester" and Evershed's made me. We don't want to spoil a beautiful friendship, do we?

* * *

***Evershed engine throttle controls have been fitted to the Bristol Brabazon I.***
***Test engineers report: "Trouble free service . . . no difficulties or complaints"***

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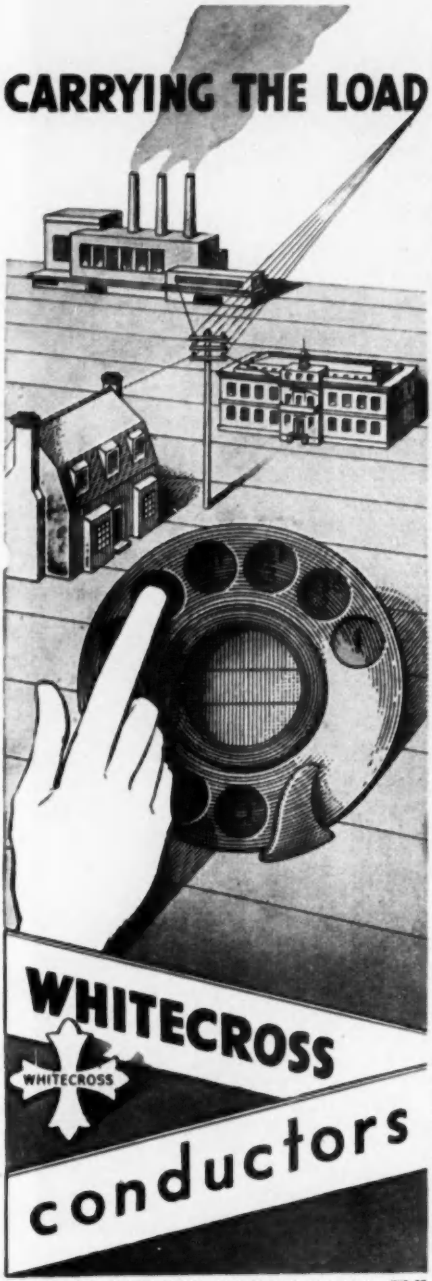


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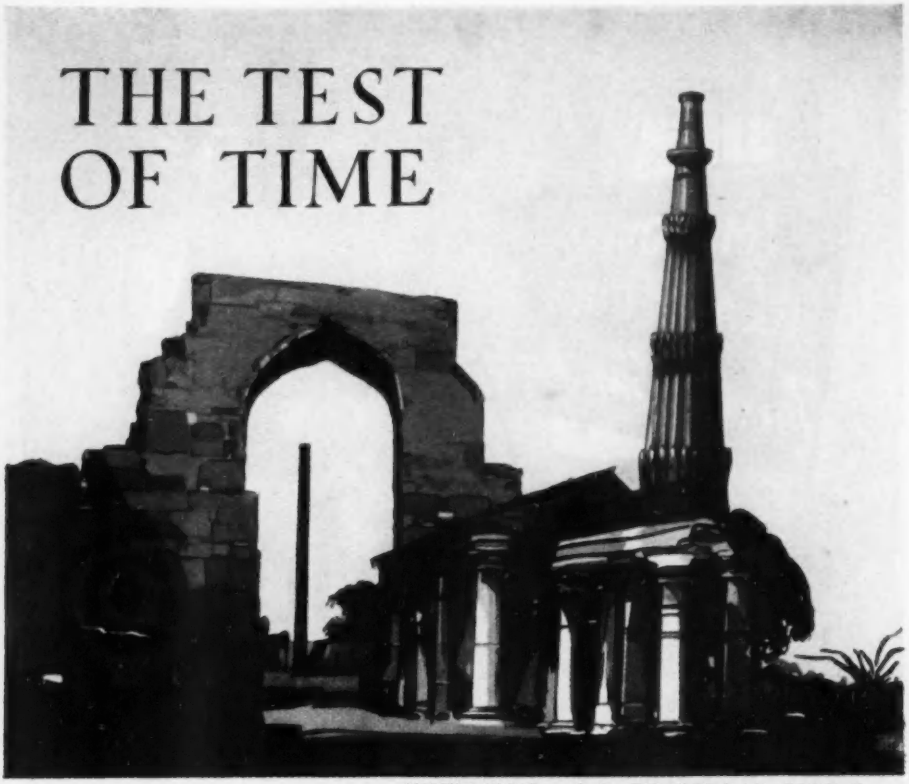

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*This great memorial, considered to be the most perfect tower is 238 ft. high and built of red sandstone.*

*Within the forecourt of the Mosque is the enigmatic IRON PILLAR, erected A.D. 415. It stands 23 ft. high and weighs 6 tons . . . through all the centuries and extremes of heat and rain it has shown no sign of rust.*

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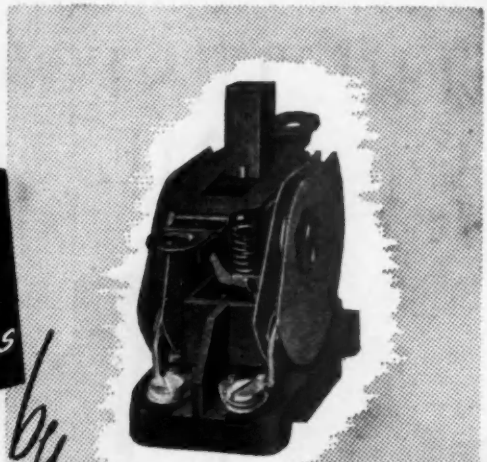
# NEW

## IMPROVED HEAVY DUTY *Tumbler Switches*



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**30 AMP. 250 VOLTS**

**20 AMP. 600 VOLTS**
**Double Pole**
**Triple Pole**
**Four Pole**
**Single Pole change-over**
**Double Pole change-over**

**60 AMP. 250 VOLTS**

**30 AMP. 600 VOLTS**
**Double Pole**

***FOR PANEL MOUNTING OR IN PRESSED STEEL BOXES FOR SURFACE MOUNTING***

● Arrow precision-built quick make and break tumbler switches are of rugged construction yet small in size. Blades are of highest quality phosphor bronze to our own specification and insulation materials are of best quality, manufactured to our own high standards.

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The switches have smooth positive action ; Arrow special TIGHT-GRIP terminals make them extremely easy to wire.

They are particularly suitable for mains isolation or for motor control where over-load protection is not required — also for oil burners, air conditioning equipment, industrial refrigerators, motor driven machinery, heavy lighting loads, electric pumps etc.

Protect the reliability of your installation or products by an Arrow Switch of proven efficiency.

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# For your new Transformer

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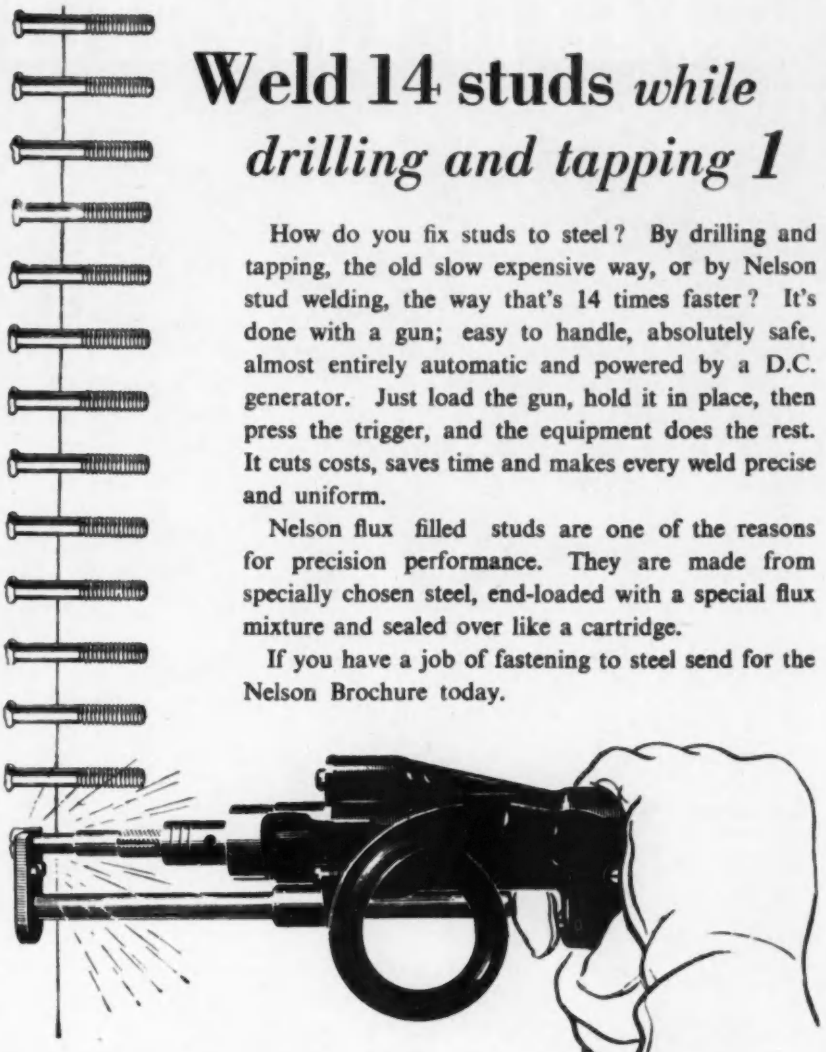
How do you fix studs to steel? By drilling and tapping, the old slow expensive way, or by Nelson stud welding, the way that's 14 times faster? It's done with a gun; easy to handle, absolutely safe, almost entirely automatic and powered by a D.C. generator. Just load the gun, hold it in place, then press the trigger, and the equipment does the rest. It cuts costs, saves time and makes every weld precise and uniform.

Nelson flux filled studs are one of the reasons for precision performance. They are made from specially chosen steel, end-loaded with a special flux mixture and sealed over like a cartridge.

If you have a job of fastening to steel send for the Nelson Brochure today.



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**STUD WELDING SERVICE**

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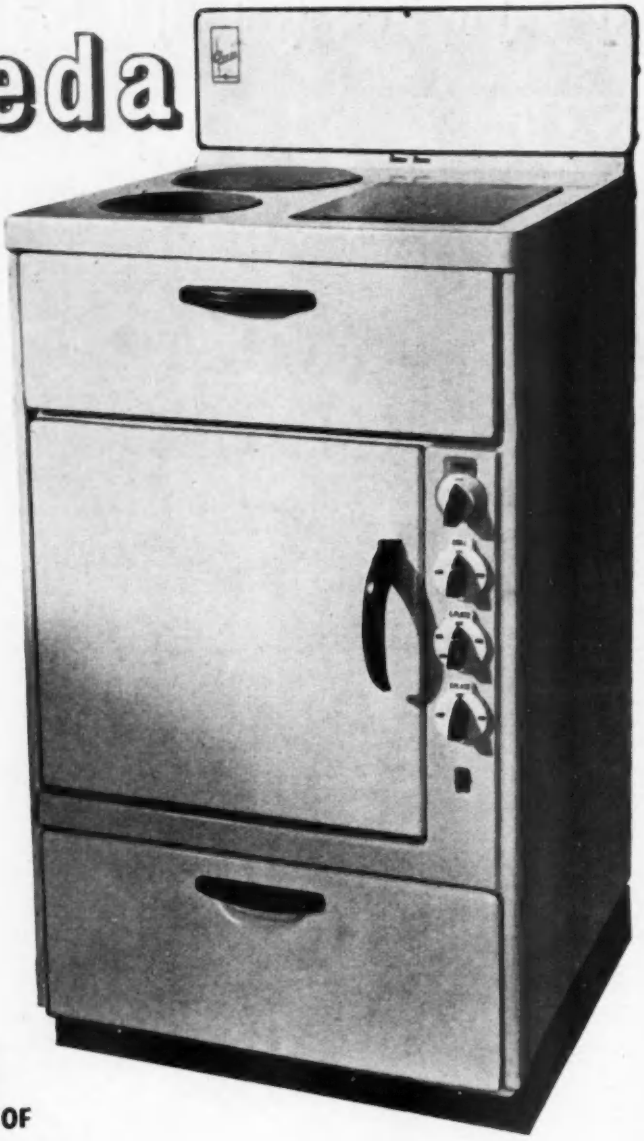

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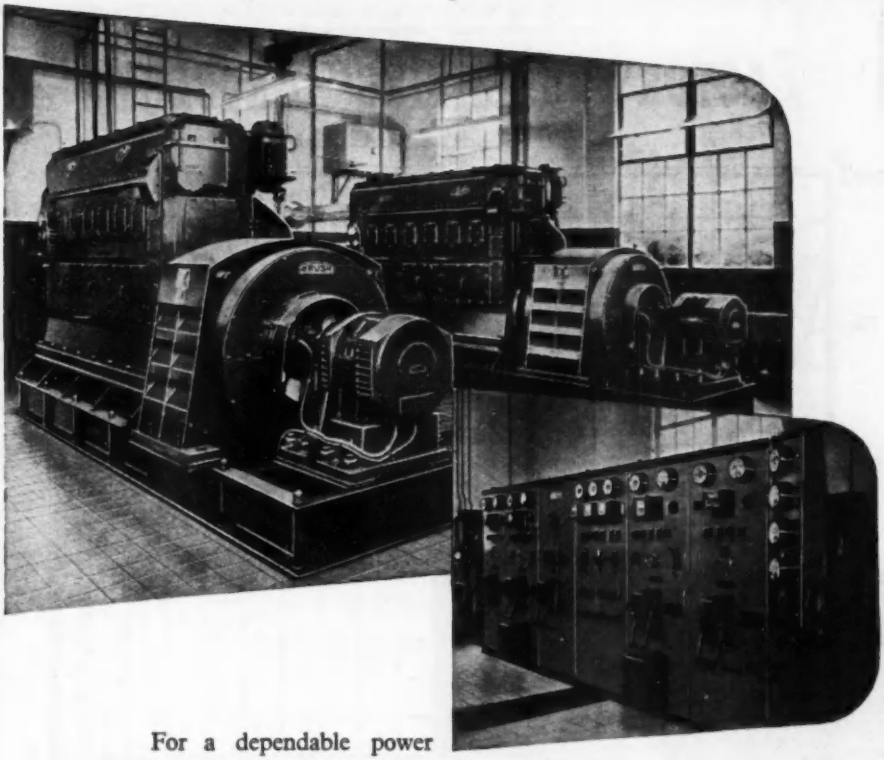

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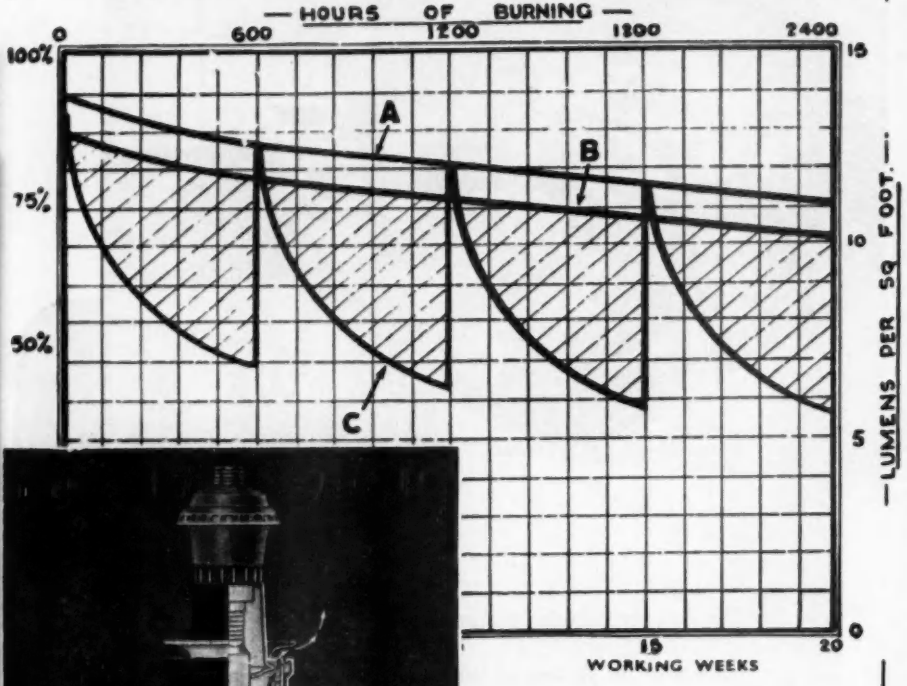


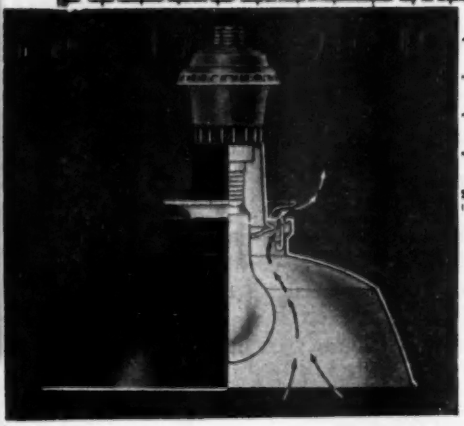

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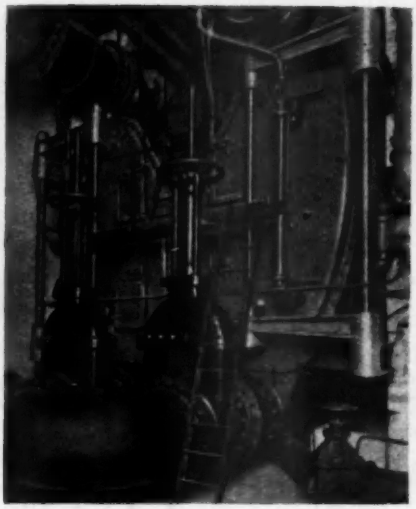

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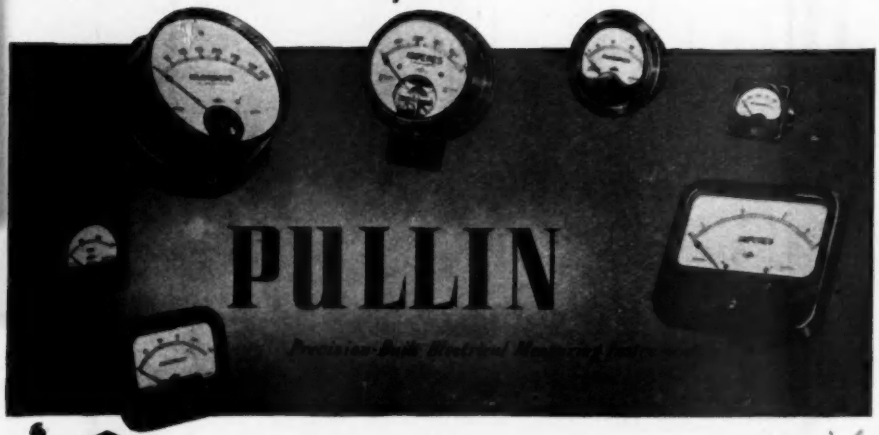


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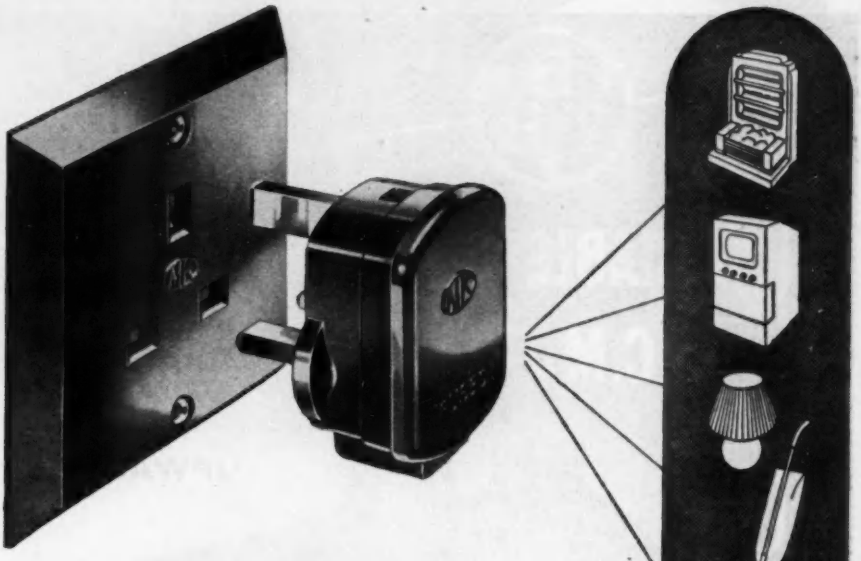

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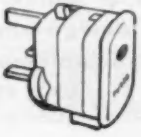

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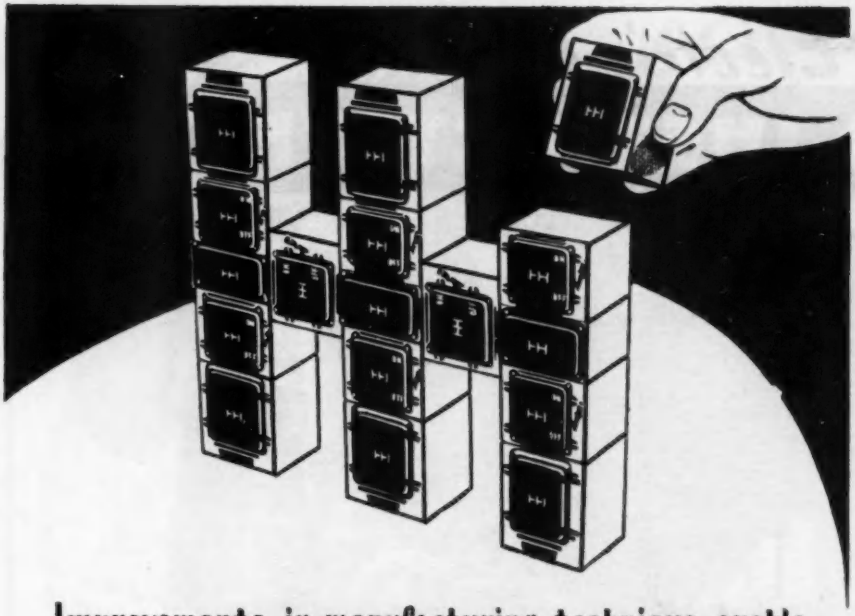

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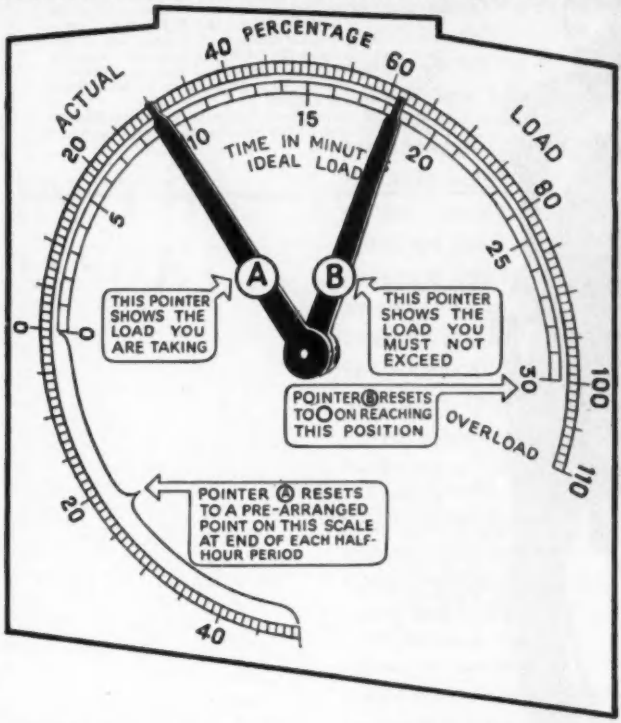
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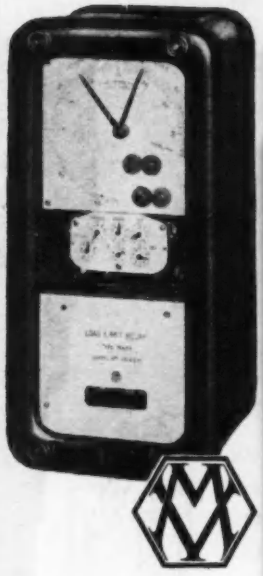

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Vol. 117 No. 3042 THURSDAY, FEBRUARY 23, 1950

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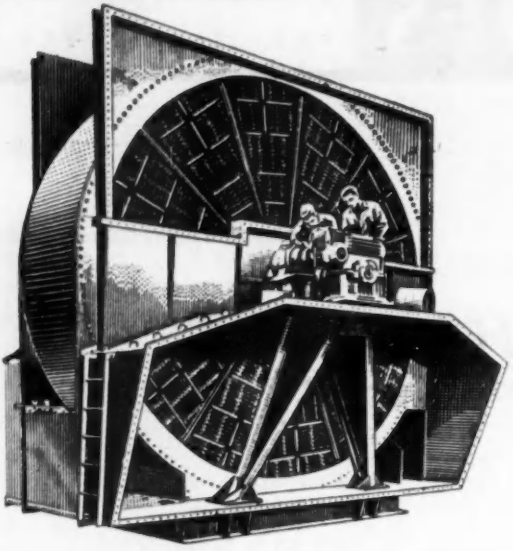

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Volume 117 No. 3042 ELECTRICAL TIMES Thursday, February 23, 1950

# EDITORIAL

## *Transformer Noise*

A RECENT A.I.E.E. paper on noise in power transformers is of some significance to engineers in this country. Prior to the war, attention had been focused on this problem on both sides of the Atlantic, but the intervention of more urgent problems caused a cessation not only of research work, but of complaints from the inhabitants of residential areas. Now, it appears, the public in the U.S. is becoming more critical, and it is only logical to suppose that this attitude will, sooner or later, be repeated in this country. That being so, it behoves us to anticipate events instead of waiting until they are upon us, since it has been found by experience that, once complaint has been made, it will not be stilled until the noise has been reduced to a level very much lower than that which would have been tolerated in the first place. The problem in this country varies in detail from that facing American engineers. In our favour, is the fact that noise, being primarily due to magnetostriction, is a function of flux density, and our designers use, in general, lower densities than are common practice in the U.S. On the other hand, our island is more densely populated, and it will be more difficult to avoid locating outdoor substations away from residential areas.

## *Wanted: A New Steel*

CHURCHER and King in their 1940 I.E.E. paper pointed out that inadequate core construction can lead to excess noise, but measures beyond those habitually used will not give any significant reduction. Even a reduction in flux density is not a practicable method, since to reduce noise level by 20 phons would require a 40% reduction in flux density. The ideal solution, of course, lies in the direction of reducing magnetostriction, as was indicated by H. M. Lacey's contribution to the discussion on this paper. It is well known that magnetic materials in the nickel-iron class have an optimum point (about 80% Ni) where magnetostriction becomes zero. While this material, in addition to other disadvantages, is much too costly for power transformers, the theory has been postulated that a steel containing 8% silicon would give similar results. Since it is impossible to work steels containing more than 4% Si, this is cold comfort at the moment, but it would seem that the metallurgist rather than the designer will finally provide the cure for the noise problem.

## *Suppress That Vehicle!*

ONE section of the Wireless Telegraphy Act, 1949, empowers the Postmaster-General to make regulations for the fitting of radio interference suppressors to electrical apparatus. To aid him in this task the P.M.G. has an expert advisory committee appointed by the President of the I.E.E., and this body has, we understand, reported five potentially "noisy" mechanisms that should be the subject of early Regulations. Further, with refreshing practicality, it has been recommended that the motor-car engine, traditional source of television interference, should be selected as a "test" case. There have been suggestions that consciousness of the opposition to compulsory powers evinced during the Act's passage through Parliament may make any P.M.G. unwilling to proceed with legislation. Any such reluctance must be firmly countered by pressure from the industry; suppression of most cars is a comparatively simple and inexpensive undertaking, yet trial campaigns to secure

voluntary action by car owners has proved unfruitful. If some control is not soon secured in this field, it is unlikely that the more complicated problems presented by thermostats and small motors will be settled for many years. With the extension of programme hours to be expected from a developing television service, this delay could create a most uncomfortable problem for viewers—and for manufacturers.

## *The Interference Market*

WISE manufacturers are not awaiting any extension of powers to compel the fitting of suppressors to domestic appliances. Their plans are all cut and dried. It is of interest, however, to consider the possible repercussions within the contracting industry, should legislation necessitate the suppression of existing equipment. The wise contractor, like the manufacturer, will not have wasted his time. Unless he has misread the situation, and see it only in the light of a golden harvest of over-the-counter sales of packaged suppressors, he will have been acquiring all the information he can upon the subject. In this field, as in electrical work in general, a little learning is a dangerous thing. The difference between fitting a suppressor and suppressing interference is one which is often overlooked by the inexperienced, but realised only too well by those unfortunates who have lightheartedly embarked upon a difficult case of interference, as they contemplate hours—or even days—spent in ceaseless experiment, with the sale of a five-shilling suppressor as their sole prospective reward. The E.C.A. could do a valuable service for its members in organising lectures on suppression at its local centres. These need not cover the entire field of suppression, and need not delve too deeply into theory. But they should emphasise that there is more to the suppression of interference than is commonly believed, and they should, above all, be directed towards enabling the contractor to decide which cases he can tackle himself, and which should be left to the specialist.

## Next Week . . .

*Following relaxation of paper controls, the "Electrical Times" will appear as from next Thursday, March 2 with a considerable increase in the number of editorial pages and a new front cover. In addition, we have been able to obtain better paper, to ensure a higher standard in the quality of reproduction of illustrations. Since the demand is expected to be heavy, it is advisable to order your copy in advance, to avoid disappointment. The price remains unchanged.*

## *Transductors*

AMONGST the applications of the transductor which are listed in our leading article this week, probably none appeals so strongly as the possibility of replacing the shunt for heavy d.c. measurements. One of the oldest and most convenient devices in use by the industry, the shunt, has inherent disabilities in heavy ratings such as are used in electro-chemical work. A 20,000 amp shunt, for example, is bulky and inconvenient to house, and it produces nearly as much heat as the average electric fire. From this point of view, the transductor wins hands down. It has, however, certain accompanying disadvantages, the chief one being the necessity for an a.c. supply. Bearing in mind that equipment of this rating is normally used for overload relay operation—since direct trips are seldom practicable—the reliability of this supply becomes of paramount importance. Most engineers are reluctant to use external supply with the risk of failure at, possibly, a critical moment, while attempts at "building-in" a supply by vibrators or inverters merely adds further complications. It is for this reason that, although the transductor principle was applied in this manner over a decade ago, the shunt will probably hold its own for a long time to come.

Meteor

# Transductors and their Application

By LENNART F. BORG*

THE principle of using the non-linear magnetic properties of iron for the purpose of controlling alternating current by means of d.c. has long been known and practised, separate windings being employed for the two currents and arranged on one or more iron cores. It is not unnatural, therefore, that this unit has been regarded as a reactor, in which the incremental permeability of the core is varied by means of direct current. It is also for this reason that the device has become known as the "Saturable Reactor."

By using a device of this kind it is possible to effect control of an a.c. power by means of an insignificant d.c. power—hence it is also known under the name "Magnetic Amplifier." Such a magnetic amplifier may be said to consist of a number of saturable reactors.

A closer examination of the mode of operation reveals, however, that in order to carry out design calculations for the purpose of utilising the properties of the iron core to the full, a detailed study of the oscillographic cycle will have to be made. It will then be found that the mode of operation departs noticeably from that of the common reactor, and necessitates an entirely fresh approach to the problem. (1, 2 and 4.)

It is for this reason that the name "Transductor" has been proposed for giving a short and significant designation of the device. A transductor may consist of a number of cores provided with windings, and each such core is referred to as a transductor element. A magnetic amplifier may be regarded as one type of transductor, whereas the transductor is not always used as an amplifier.

* Mr. Borg is with Allmänna Svenska Elektriska AB, Ludvika, Sweden.

## *Elementary Circuits*

In many applications it is desirable to avoid induced voltages in the d.c. windings. A transductor connection commonly used for this purpose is shown in Fig. 1a. This connection suffers from the drawback of magnetic leakage, which impairs the properties of the transductor.

Fig. 1b shows how the stray flux may be eliminated by employing a four-limbed core. As this type of core is complicated to manufacture, it is usual to employ two separate cores, as indicated in Fig. 1c or 1d.

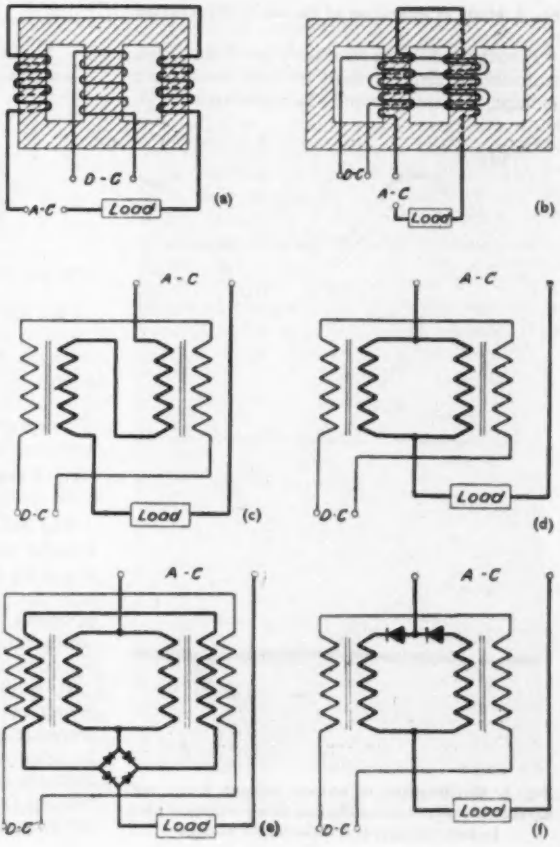


**Fig. 1. Fundamental transductor connections**

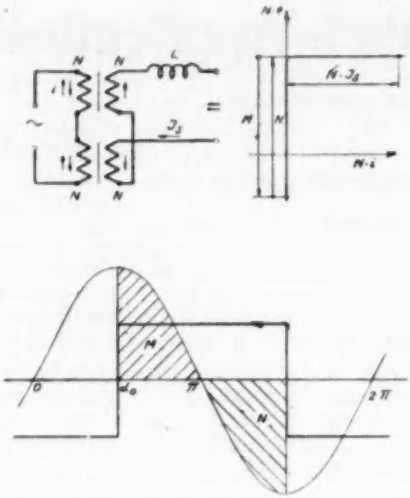

Fig. 2. Mode of operation of the series transductor

A varying flux is a necessary condition if the transductor element shall be able to absorb voltage, and this can only be achieved with an unsaturated core. Assuming that the d.c. control current in Fig. 1c, known as a series transductor, is smoothed, then voltage can only be absorbed by one element when the ampere turns of the two windings cancel each other. This condition is only present for one element at a time, and the a.c. current must therefore alternate periodically between positive and negative values of the same amplitude, in accordance with Fig. 2. Any variations in the d.c. current must be accompanied by corresponding instantaneous variations in the alternating current. If the a.c. current is rectified, it will present a true image of the d.c. control current and the device is therefore in effect a d.c. transformer. The dependence of the secondary current on the alternating voltage and the load impedance introduces only a minor error into the transformation ratio, and the magnetic properties of the material are of minor importance.

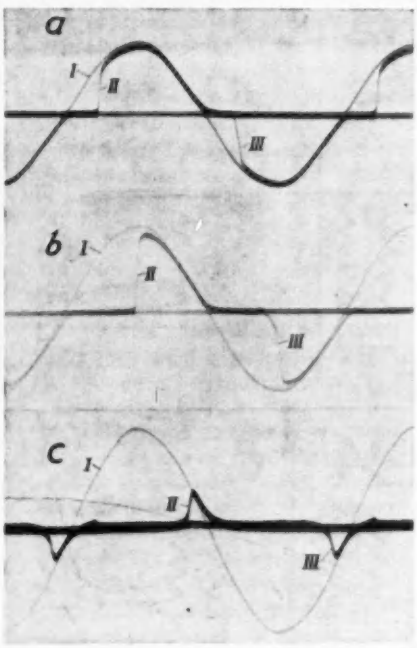


Fig. 4. Oscillogram of output voltage from self-excited transductor at different output voltages a b c. I—line voltage: II & III—output voltage

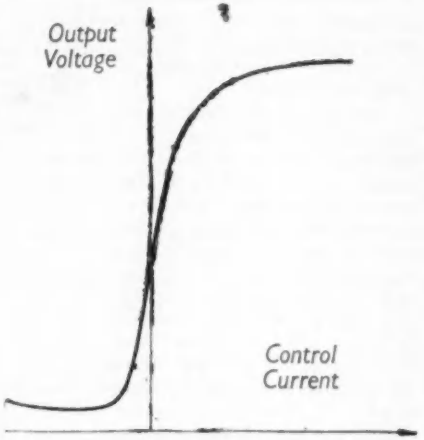


Fig. 3. Transfer curve of self-excited transductor

The connection shown in Fig. 1d is called a parallel transductor. This also possesses the character of a current transformer, but only in regard to the mean value of the current. It possesses the advantage, as compared with the series transductor, that no voltage is induced in the control winding.

It is possible substantially to reduce the power required in the control winding of the transductor by employing self-excitation. This is achieved by rectifying the output current from the transductor and then using it for magnetising the transductor by means of a separate winding, as shown in Fig. 1e. It can be demon-

strated (3) however that this coupling is equivalent to that shown in Fig. 1f, which is termed "simplified self excitation."

Self-excitation gives a relationship between the control current and the output voltage, the principle of which is shown in Fig. 3. The steep portion of the curve represents a power amplification which may attain very high values. This connection does not possess the above-mentioned current transformer characteristics, the output voltage instead being determined by the control current.

Fig. 4 is an oscillogram of an output current cycle. It will be seen that the transductor is in

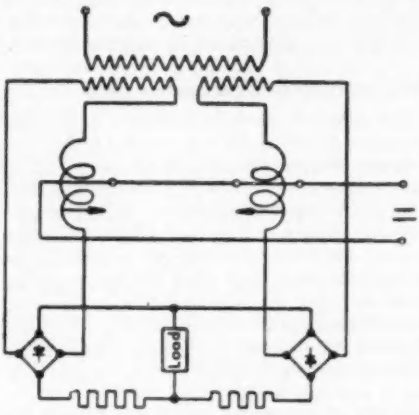


Fig. 7. Push-pull amplifier for measuring purposes

effect similar to a thyratron, blocking the current during part of the cycle and passing it during another part. A closer study (4) of this mode of operation enables the requisite design data to be derived for the purpose of ensuring the optimum performance of a given core. However, this is outside the scope of the article.

When dealing with larger power quantities, the transductor may with advantage be of three-phase design, comprising six cores.

## Dynamic Properties

The output voltage of the transductor may be altered by adjusting the control current, which accomplishes the requisite alteration in the mean flux in the core. This alteration can only be carried out by supplying or extracting a quantity of magnetic energy, a process which can only be accomplished in a finite time. A change in the control voltage will therefore be accompanied by a variation in the control current, in a similar manner as the current flowing in a reactor with series resistance. The resultant

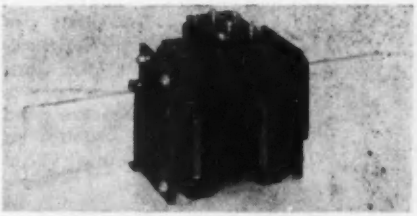

Fig. 5 Measuring transductor rated 750/0.5 amps. (ASEA)

change in the transductor output voltage will however follow the control current as rapidly as the a.c. frequency permits. The transductor will therefore have a time constant which is approximately expressed by the formula:

$$T = F \frac{n_c}{n_{ac}} \frac{1}{2f}$$

where:

T = time constant of the transductor in seconds.
F = voltage amplification.
$n_c$ = number of turns of the control winding.
$n_{ac}$ = number of turns of the a.c. winding.
f = supply frequency in cycles per second.

It will be seen from the above formula, which is valid independent of self-excitation, that the time constant of the transductor may be reduced by raising the frequency, reducing the amplification factor F or reducing the number of turns in the control winding $n_c$. The latter expedient is particularly suitable if high-grade magnetic materials are employed in the transductor. The time constant is a function of core material, core dimensions and winding space and can be calculated for a series of cores.

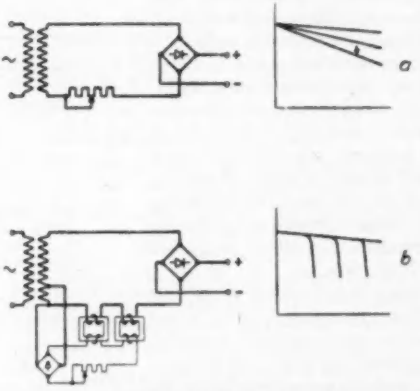


Fig. 6. Metallic rectifier controlled by (a) a resistor (b) a transductor

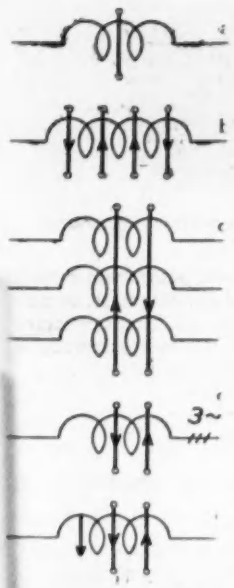


Fig. 8. Graphical symbols for transductor. (a) general symbol (b) single phase transductor with control windings (arrows indicate relative jump directions) (c) 3-phase transductor. (d) ditto simplified (e) transductor with self-excitation

The fact of being able to calculate the time constant of a transductor used in a control or servo system makes it possible to predetermine its effect on the frequency curve of the system, in the same way as for any other component of the system.

### *Non-self-excited Transductors*

The transductor connections shown in Figures 1c and 1d possess the above described current transformer characteristics. The coupling shown in Fig. 1c, where primary and secondary currents closely accompany one another, is especially suitable for measuring d.c. currents. This particular arrangement is referred to as a measuring transductor and is illustrated in Fig. 5. The two cores are seen embracing the busbar which carries the current to be measured. The use of a measuring transductor is especially appropriate in those cases where heavy currents are to be measured, when the point of measurement is at a high voltage level, or when a comparatively heavy load power is required or the latter is to be used for telemetering. Measuring transductors for currents up to 60,000 amps are in operation.

With transformer stampings of ordinary quality, an accuracy of ± 2 per cent. may easily be achieved, and this accuracy may be considerably improved by employing special grade cores or simple compensating devices.

Fig. 6 illustrates an example of a metallic rectifier, the current output of which is controlled by means of a series transductor, as compared with the control obtained by mean of series resistors. The series resistor gives rise to a voltage drop, resulting in a current-voltage characteristic of the rectifier such as that shown in Fig. 6a. The corresponding control curve obtained with transductor control is shown in Fig. 6b. This method of rectifier control provides a practically constant output current within the control range for which the transductor is designed. Suitable applications of this method are, in certain cases, charging of batteries, arc lamp operation, etc. The overall efficiency obtained with transductor control is considerably higher than with rheostat control.

### *Self-excited Transductors*

It is evident that the transductor is suitable as an amplifier in all those cases where the slowness of its response compared with that of the electronic valve does not entail any disadvantage. Fig. 7 illustrates a transductor circuit, in which two transductors are arranged in push-pull. This arrangement is particularly suitable for measuring small currents, such as those obtained from thermo-electric elements or selenium photoelectric cells. It is even possible to use it for amplifying audio frequencies, provided that the frequency of the supply voltage is sufficiently high.

In Fig. 7 the transductor is represented by the symbols listed in Fig. 8. Each such symbol corresponds to a transductor consisting of several cores—in this case there are two cores.

The most significant application of the transductor, however, is its use for regulating

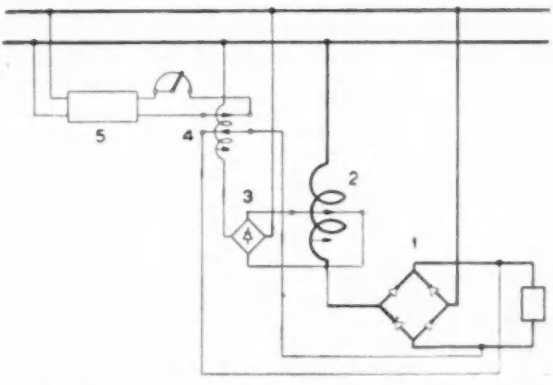


Fig. 9. Constant voltage rectifier for floating charge of batteries

metallic rectifiers and as an amplifier for an output of the order of 100 W, for which purpose it is gradually superseding rotary machine amplifiers, contact regulators, and the like.

Fig. 9 shows the elementary circuit of a metallic rectifier delivering constant voltage. 1 is the main rectifier, the voltage of which is regulated by the main transductor 2. The latter is in its turn controlled by the amplifier transductor 4 via the rectifier 3.

The amplifier transductor is equipped with two control windings, one of which is excited by a constant current supplied by a constant current device 5, while the other carries a current proportional to the output voltage from the main rectifier. The magnetomotive forces developed by these two windings counteract each other and in this way the amplifier transductor will be controlled by the amount by which the output voltage deviates from a nominal voltage. In this manner it is possible to maintain the output voltage constant with a very high degree of accuracy.

This type of transductor controlled rectifier is particularly suitable for floating charge of accumulator batteries, and has the desirable effect of substantially increasing the life of the battery. It is also usual to supplement the rectifier with a device for limiting the charging current, in which case the rectifier set is referred to as an "avostat" rectifier (the word is derived from "ampere-volt-static").

Another important application of the transductor is its use in voltage regulators for alternators. Small a.c. generators may be controlled very simply, by letting the transductor supply a bucking voltage in the field circuit of the exciter. The transductor is itself excited from the a.c. terminals of the generator, and the voltage sensing system may consist of one linear and one non-linear circuit, the two currents of which balance one another when the generator output voltage is at its correct value. The appearance of a regulator of this type for alternators up to 300 kVA is shown in Fig. 10.

The same principle may also be applied to larger generators, but the transductor is then allowed to operate via a booster exciter, so that the transductor need only be designed for handling a moderate current. Transductor regulators of this type are at present being used for generator ratings up to 65,000 kVA.

Among the multitude of uses to which the transductor has been successfully applied may be mentioned supply voltage regulators, speed regulators, intermittent signalling devices, etc. In all these applications the transductor has scored over other devices because of its dependability and simple construction, which are mainly derived from the absence of any moving parts.

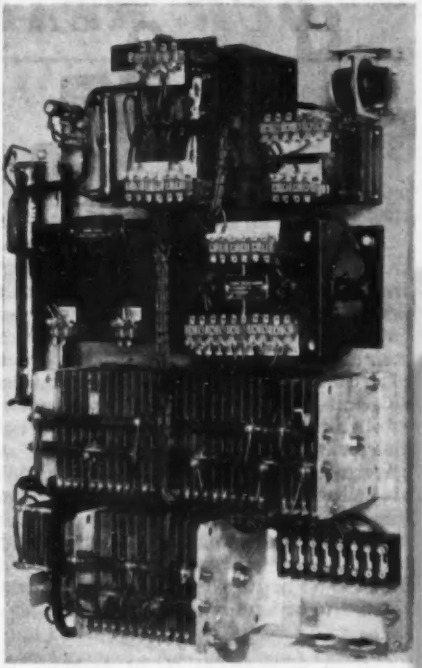

**Fig. 10. Transductor type voltage regulator for alternators up to 300 kVA (ASEA)**

In addition to the many practical uses for which the transductor has amply demonstrated its suitability, there are many others which yet remain to be developed. In many cases the transductor can be used as a substitute for the electronic valve for handling high outputs, as the latter has often shown itself to be not altogether dependable. In other applications the transductor may be controlled by a low-power output valve.

## *Acknowledgement*

The author wishes to express his thanks to Dr. A. Uno Lamm for valuable advice in preparing this article and to Messrs. ASEA for permission to publish it.

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# OUR READERS' VIEWS

## Wooden Poles

May I be permitted to refer to certain points in the article entitled "Pre-stressed Concrete Poles"?

The softwood pole has proved its case on grounds of economy, durability and performance over several generations. From time to time various alternatives have been proposed but have usually been discarded by reason of their high cost or unsuitability. It is interesting to recall that in the past the main argument advanced against the use of hardwood as a substitute for softwood was its increased weight and consequent increase in handling and erection costs. On an average, hardwood poles are liable to be 30% heavier than softwood and this has been considered ample cause for rejection. The pre-stressed pole in addition to its initially higher cost is nearly three times as heavy as the softwood pole, but this no longer appears to be an insuperable objection.

One of the most disturbing factors in current industrial development is the apparent disregard of costs of construction, yet it has an obvious and important bearing on production costs, which must be lowered if British industry is to survive after the end of Marshall Aid.

The only merit advanced in favour of the pre-stressed concrete pole appears to be in regard to its alleged aesthetic value, its "more pleasing" appearance. Now, I think it is fairly clear that whatever design is produced in concrete can be produced in wood. Generally speaking, it has to be produced in wood first, and the form and shape of concrete products are determined quite as much by the properties of wooden moulds as by the concrete itself. Had an earlier generation proposed the use of built-up wooden poles of the kind illustrated in your article, I have no doubt it would have been accused of unwarrantable extravagance, in spite of the fact that such poles would still be cheaper than pre-stressed concrete.

So far as durability is concerned, the properly treated wooden pole has proved itself good for a life of at least 30 or 40 years. There are telegraph poles still in service after 70 years. The pre-stressed pole is something of an unknown quantity. It is apparent that the small diameter wires used as the pre-stressing element will not stand the effect of corrosion indefinitely, while the natural "creep" effects in concrete must result in a gradual but continuous relief of internal stress. Once this has persisted to the point where tension cracks can form, the corrosion of the wires seems likely to be very rapid indeed, with a consequent danger to the stability of the structure as a whole.

*Phillip O. Reece*

## Shift Workers' Qualifications

The information concerning the banning of correspondence tuition for Associate Membership of the I.E.E. should receive widespread publicity, in view of the fact that even at the present moment one has only to look in any newspaper to read of courses offered for this examination by many correspondence tuition establishments. This is misleading.

As yet the comments have been made mainly with regard to the power station engineers, but there are many others in the same plight, including those whose work entails extensive travelling and whose hours may be irregular, as in public utilities and maintenance departments. In such cases if a man wishes to further his education then he must take his learning with him, instead of going to it. Surely, if a man is willing to devote his spare time to pursuit of knowledge, he is equally entitled to an unbiased consideration, as is his more fortunate colleague.

Having attended evening classes for a number of years, and now having to study by correspondence by reason of the nature of my work, I feel entitled to give an opinion of the merits of each of these methods. To my mind, whereas the first was usually a series of hurried lectures, with no recapitulation of awkward points, the second gives a student a more precise and explanatory course of instruction.

My case is summed up in the question :— If correspondence tuition was good enough in the past to attain the degree of knowledge requisite for this important qualification, why should it now be considered inadequate? A satisfactory answer to this question from the I.E.E. would surely dispel any doubts as to their intentions, which at the moment I tend to view with alarm.

*J. T. Roberts*

Dundee.

# *Writing for the TECHNICAL PRESS*

By JOHN H. JUPE, A.M.I.E.E.

AT the conclusion of research or development work there often arises the important matter of publication, and it is surprising how many engineers treat this part of the work in a way which gives neither themselves nor others the maximum benefit from their investigations.

It is of course desirable that formal publication should be made in the proceedings of a learned society, so that fellow researchers may learn, comment and criticise. But in most cases the engineer receives a salary which is ultimately derived from industry and unless he pays attention to its needs his laboratory will not be allocated so much money as it could be, and his work and salary must thereby be handicapped. One of the prime needs of an industry is that its customers shall know what has been achieved and what the leading firms are doing to improve the products. This is a main function of the technical Press, and it is one of the duties of the development engineer to tell the world through the medium of the Press what his firm has achieved. He must face up to the fact that relatively few of the men who buy his firm's products read the proceedings of learned societies. These are perused by other research workers; brilliant men but with negligible industrial purchasing power. It follows therefore, that, in the long run, if the research and development worker is to get the necessary financial security which will enable him to give of his best and his work is not to be handicapped by lack of money, he must impress on executives, by means of technical articles, that his firm is foremost in the particular industry.

## *The "No-Time" Bogey*

He should therefore make it his duty to write good, informative articles for as many technical magazines as possible, without rejecting any publications because he feels that they are "beneath" him. Writing for the technical Press is dignified and important and many of the journals, which may have circulations running into tens of thousands, are the main sources whereby industry informs its customers and earns money to pay the scientists.

The next bogey to be banished is the one of time—the time which so many technical authors imagine an article will take to write. To hint that they could do useful work by writing, say, a thousand words for a journal is to invite a remark that there are only twenty-four hours in a day. The situation is not, however, so difficult as it appears and with a little resolution a lot can be achieved. A recommended method is to spend the first ten minutes of each day in scribbling anything relevant to the subject. At 9.10 each morning the writings can be put in a folder and forgotten for twenty-four hours. At the end of a fortnight the writer will be amazed at how much has been written. This should be laid aside for a week and then re-read and any necessary revision will stand out crystal clear. The last week can be spent in doing this and there, inside a month, the article will be written, and with negligible interference with other work. Of course the prospective author may claim that past experience proves articles *do* take a considerable time. This is because time is wasted over matters which seem more important than they really are and because of an irrational fear of critical readers.

These phantasms are (1) the author feels diffident because he has not had first-hand experience of the entire subject, (2) he feels it impossible to say everything in a thousand or fifteen hundred words, (3) he is afraid readers will criticise what seems to him, superficial treatment of a subject. On (1) there is no need to fear at all, because the writer must not consider himself to be discoursing before a panel of professors who may cross-examine on every point but as a man who has been given ten minutes to tell the chairman of a big company exactly what is involved in the subject. In this he may legitimately include the work of others, even though his first-hand knowledge is slight. Indeed, as the I.E.E. has pointed out, "integrating" writing is a worthy and useful part of technological publication.

On point (2) above, the space limitation can be a blessing because it will force a distillation of thought which can only be to the good of the article. If the author has wisely put the subject to the editor as a suggestion before starting to write, he may be surprised to find that more space than he hoped for is at his disposal.

He must, however, be careful not to attempt too much in the space available and it is desirable that an article should deal with a relatively narrow aspect of some branch of technology rather than cover a wide field. An article on say, turbo-alternators might be rejected because such a comprehensive study is the subject for a textbook, while an article on the bearings of turbo-alternators might be quite acceptable.

On point (3) the author must again remember that he is writing for executives who only want the facts and that scientific niceties are neither necessary nor welcome. This can be illustrated by examples of language which might be suitable (*a*) for a learned society and (*b*) for a technical or trade journal.

| For the learned Society paper | For the Technical Magazine |
|---|---|
| . . . helium, due to the longer mean free path of the electron in the gas would need a lower electric field. . . | helium, with longer electron paths, needs a lower field. |
| . . . it will be seen that the frequency of the output voltage is independent of any frequency errors due to the local oscillator frequency | . . . this shows that output frequency is unaffected by local oscillator errors |
| . . . the high resistance at the barrier may be ascribed to a foreign layer of insulating material such as an oxide, on the surface, or to a layer of pure semi-conductor, i.e. a layer free from impurity centres be postulated to exist on the surface. . . | . . . an oxide layer can cause high resistance at the barrier, so can a layer of perfectly pure semi-conductor |
| . . . this calibration was carried out at a low frequency and showed that the capacitances were logarithmic over the major portion of their scales, departing from this law at close spacings between the plates. | calibration was at low frequency and produced logarithmic capacitance scales except for close plate spacings. |
| since the step-by-step procedure recommended for deriving the correction factors may have been somewhat lost in the preceding explanatory matter and algebra, it is felt that it will be helpful to extract the relevant parts of what has gone before and to present them in the form of a set of instructions. | the following is a summary of the method previously described. |

Unessential words must be avoided and it is both displeasing to the editor and boring to the reader (who may be an influential executive) to say "subjected to the influence of a magnetic field" if "magnetised" is substantially true.

Two other parts of an article which frighten engineers are the beginning and end. Almost all writers, except those who write for a living, spend a tremendous amount of time over the first and last paragraphs, which an editor could happily delete without spoiling the article. The solution is to plunge straight into the rough draft with some hard facts. No preliminary cantering with platitudes, obvious things, or vague matters of opinion. At the end, do not be afraid to stop dead. Like this.

# Twenty-five Years of E.T.C.T.A.

SIR HENRY SELF was the chief guest at the Silver Jubilee lunch held by the Electrical Trades' Commercial Travellers' Association last Friday, when more than 500 members and guests were received by Mr. N. V. Everton (president) and Mr. C. L. Elvy (chairman).

The first item, following the loyal toast, was the affixing of a silver jubilee bar to the chairman's collar by Mr. A. S. Markes, after which the chairman, on behalf of Mr. S. Johnson, absent due to illness, made a charity appeal in which he referred to last year's £1,100 on behalf of Mr. Leslie Gamage's fund for the schools (see our issue for February 2).

Sir Henry Self, proposing the toast of "The Association," pointed out that the B.E.A. was also a member of the electrical family. He suggested that Benjamin Franklin would make an admirable patron saint for the Association.

Mr. N. V. Everton, the president, in reply, commenced by paying a tribute to Mr. A. S. Markes and Mr. C. W. Sully, the founders of the Association. He hoped that the members would not be content with celebrating the Association's jubilee and let it remain at that. Membership was now 670, and if they increased it to 1,000, they would really have achieved something to mark the jubilee year.

Quoting Charles Bryants' "The key to a nation's future is in its past," he made allusions to the "Hungry Forties" and the "Fighting Fifties." Could we, he asked, guide our steps in the light of the past? If so, he hoped that the 1950's would again be the fighting Fifties—fighting for benevolence, peace, and private enterprise.

Mr. F. R. Robbins proposing "The Guests," gave a brief and amusing account of the activities of the "Etceteras" as the Association was often called. Mr. T. F. Clarke replied in a speech which was as pointed as it was amusing.

Replying to the toast of "The Chairman," proposed by Mr. W. Herbert (past chairman), Mr. Elvy gave a brief account of the E.T.C.T.A.'s early history. In his opinion, the Association should enlarge its scope to include those who travelled for associated industries. A collection taken during the evening realised £104.

# ELECTRIC TRACTION for GOODS TRAFFIC

## *Details of the Sheffield-Manchester Scheme*

THE railway system connecting Sheffield, Wath, Penistone and Manchester is one of the most difficult, from a working and maintenance viewpoint, in the country. This is mainly due to the severe gradients encountered, the heavy coal traffic to be handled, and the long tunnel at Woodhead. A scheme for the electrification of this section of line was originally approved by the directors of the former L.N.E.R. in 1936. It was then estimated that electrification would increase the capacity of the line by a considerable extent, particularly through the Woodhead Tunnel, where an increase of as much as 25% was anticipated. The distinguishing feature of the scheme is that all classes of traffic will be electrically hauled and it will afford the first British example of a completely electrified railway service.

A further important point was that the rail life in the tunnel would be much improved; at present, under steam conditions the life expectation is only about 3-3½ years, as compared with 15-17 years in the open. Preliminary work was therefore started, but the 1939 war caused postponement until 1947, when approval was given for work to be resumed.

The present work involves 75 miles of route and a total of 330 miles of track, and will be carried out in four stages: (1) Wath-Dunford; (2) Dunford-Manchester (London Road); (3) Sheffield-Barnsley Junction; and (4) Fairfield Junction-Manchester (Central).

### *Power Supply*

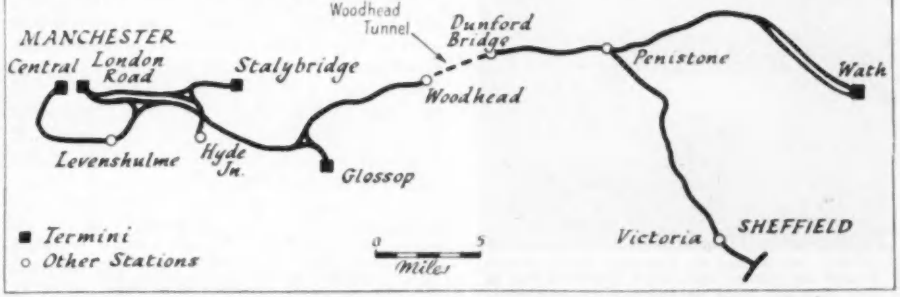
Primary power will be supplied by the B.E.A. at 33 kV to three traction substations at Gorton, Neepsend and Aldham Junction. These three supply points will be interconnected by cable routed alongside the track on concrete posts. This cable also loops into the other traction substations and thus provides alternative traction supplies in the event of an interruption at any one supply point.

In all eleven traction substations will be erected, each containing 33 kV switchgear, mercury arc rectifier equipment for converting from 33 kV to 1,500 V d.c., d.c. switchgear and control equipment. Total capacity of the rectifying plant is to be 47,500 kW. Between the substations there will be installed track sectioning cabins to provide fault protection and facilitate sectioning of the overhead conductors. None of the substations nor the track sectioning cabins will be normally attended, but will be controlled by remote supervisory control from a centre located at Penistone. The necessary pilot cables will be carried on the same posts as the high voltage cable.

The overhead system of electrification at 1,500 V d.c. is particularly suited to this section of the railway system, as it enables freight trains to be handled with safety and is the least susceptible of all systems to the arduous weather conditions—snow, floods and icing—encountered in the area.

### *Overhead Line Equipment*

The overhead line equipment will be similar to that used on the Liverpool Street-Shenfield scheme described in our issue of Sept. 29, 1949. The compound catenary arrangement will be used, using a solid grooved cadmium-copper contact wire. Steel bridge structures at a normal spacing of 210 feet support the catenary, the spacing being modified as necessary on curves. Owing to the intensive colliery




Map showing the principal lines affected by the Manchester-Sheffield-Wath electrification scheme

workings in the district, certain areas are particularly liable to subsidences, and in these parts, the height of the cross member supporting the catenary has been made adjustable with respect to the track level. Special anchor structures are arranged approximately every mile and where overlap is necessary, such as at substations and track sectioning cabins.

Return current to the substations is taken via the track rails, which will be bonded with stranded copper bondwelds across joints.

## *Locomotives*

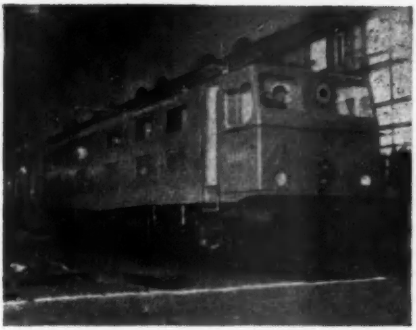
The bulk of the traffic will be hauled by 85 mixed traffic electric locomotives which will work express and slow passenger trains, express and ordinary freight trains and mineral trains, and in addition will also perform banking and shunting duties. The local passenger services between Manchester (London Road), Hadfield and Glossop will be provided by eight three-coach multiple-unit electric trains, and the train mileage in these local services will be increased by some 48,000 miles per year.

Of the 85 mixed traffic locomotives, 58 are of the double bogie, four-motor, four-axle type having a continuous rating of 1,360 h.p. at 56 m.p.h., and a one-hour rating of 1,868 h.p. at 45 m.p.h. The maximum tractive effort at starting will be 45,000 lb, with an overall weight of 88 tons. Maximum speed, however, is 65 m.p.h.

The remaining 27 locomotives will be of the double bogie, six-motor, six-axle type with a continuous rating of 2,298 h.p. at 46 m.p.h., and a one-hour rating of 2,490 h.p. at 44 m.p.h. The weight of these units will be 102 tons and the maximum speed 90 m.p.h.

Both types are equipped for regenerative braking to control trains on the long down grades encountered, and will be equipped with

**Gilroy Lane Bridge. It is a prefabricated concrete bridge designed so that superstructures can be jacked up to a new level to allow for anticipated track subsidence**



**First of the new locomotives at Gorton works**

electro-pneumatic control gear and Westinghouse straight air brakes with additional facilities for the vacuum braking of passenger and freight trains.

The bodies and bogies of the locomotives will be fabricated at Gorton locomotive shops, but the electrical equipment will be erected by Metropolitan-Vickers at the Dukinfield factory of British Railways which is being modified for the purpose.

The multiple-unit rolling stock being provided is of the open saloon type and will be identical with that provided for the Liverpool Street-Shenfield system, except that first- and third-class accommodation will be provided.

## *Civil Works*

Good progress has been made to date with the extensive civil engineering works connected with the scheme. A new single-line tunnel has been completed at Thurgoland and the track in the old tunnel re-positioned centrally to give the clearances necessary for the overhead line equipment. Many of the old masonry bridges also did not provide the necessary clearance, and have been, or are due to be, reconstructed. Pre-stressed concrete structures have been adopted in many of these cases.

The major undertaking in the civil engineering field is the construction of a new double-line railway tunnel over three miles long, through the Pennine Range, from Woodhead to Dunford Bridge. It is estimated that this work will be completed in 1952. The total cost of the complete scheme will be in the region of £2,800,000 which includes the laying of the track and resignalling.

### MAIN CONTRACTORS

Overhead lines: B.I. Callender's Cables Ltd.
Cables: W. T. Henley's Ltd.
Substations: Bruce Peebles Ltd.
H.T. switchgear: A. Reyrolle and Co., Ltd.
Traction equipment: Metropolitan-Vickers and G.E.C.
Woodhead Tunnel: Balfour Beatty and Co.

# FACTORY GENERATION

## *Advantages of Combined Heat—Electric Stations*

COMBINED generation of process heating supplies and electrical energy in one plant is at first sight an attractive proposition for the industrial planning engineer. MR. C. G. CARROTHERS, B.Eng., M.I.E.E., in a paper prepared for the Association of Supervising Electrical Engineers, and presented for him by Mr. F. W. Shilstone in London on Tuesday, has performed a useful task in discussing the subject from the point of view of the engineer responsible for supervising the operation of the plant concerned.

Reviewing the general theory of combined generation, he notes that factors leading to particularly close attention being given to the idea today include the need to conserve fuel and the rapid increase which has taken place in initial temperatures and pressures for modern steam plant, the latter change making combined working far more satisfactory.

As a basis for his theory, Mr. Carrothers takes the heat balance sheet commonly drawn up for any engine, in which the heat energy, H, derived from the fuel, less the part of the energy converted to mechanical work, W, is equated to the part of the energy, h, discarded as heat. In the case of an "ideal" heat engine (Carnot cycle) this heat balance can be expressed in terms of two absolute temperatures, the first, $T_1$, being that at which the working substance of the engine receives heat, and the other, $T_2$ the temperature at which the engine discards heat. The new relationship becomes

$$h = H\frac{T_2}{T_1} = T_2\left(\frac{H}{T_1}\right) \quad (1)$$

$$W = H - h = H\left(\frac{T_1 - T_2}{T_1}\right) \quad (2)$$

In these equations $\frac{H}{T_1}$ is the increase in entropy of the working substance, when it receives heat H at temperature $T_1$; the first expression, then, effectively states that the discarded heat, h, must be at least equal to (the increase in entropy of the working substance when receiving heat) multiplied by the lowest temperature at which the heat can be discarded.

### *Steam Engines*

In practice, combined generation is usually carried out by steam engines, and the rest of the theory applies to them. In steam engines, heat is received at varying temperatures (economiser, boiler, superheater), and it is not therefore possible to assign a value to $T_1$ in the above equations. However, from steam tables it is possible to find the rise in entropy of water and steam from any feed temperature to any pressure and superheat, and this entropy change multiplied by the condenser circulating water temperature is the heat which must be discarded per pound of working substance, and $T_1$ is given by the total heat input/lb steam divided by the increase in entropy found from the tables. The appropriate calculations for a steam station working at initial pressure 1,400 lb/sq in., temperature 960° F, with feed water at 487°, is given in table 1.

TABLE 1. HEAT RELATIONSHIPS FOR 1400 LB/SQ IN. 960°F STEAM PLANT.

| Stage of heating | Heat input | Rise in entropy | Mean temperatures of heat input | |
|---|---|---|---|---|
| | A. BTh.U/lb | B. per lb | (A/B)° Abs. | (A/B—460)°F |
| 1 | 2 | 3 | 4 | 5 |
| Economiser | 126 | 0·1234 | 1020° Abs. | 560°F |
| Boiler | 576 | 0·5520 | 1047° Abs. | 587°F |
| Superheater | 294 | 0·2450 | 1200° Abs. | 740°F |
| TOTAL | 996 | 0·9204 | 1082° Abs. | 622°F |

Assume now that a generating station has the initial steam conditions noted in the table, and has a circulating water temperature of 70° F. The heat discarded would be at least 0·9204 × (70 + 460) = 488 B.Th.U., or 49% of the total heat input—i.e. the thermal efficiency is 51%. In practice losses would occur in boiler, flue gases, alternators, etc., and in the turbine. Putting the first group at 16% and the efficiency ratio of the turbine 71·4%, the thermal efficiency becomes 31%. This will be further worsened by the necessary increase in temperature of the cooling water.

Now suppose process heating is required at 240° F, then the lower limit of temperature becomes 240 + 460 = 700° F absolute. The heat discarded now increases to 0·9204 × 700 = 644 B.Th.U., or 64·8%, giving an ideal thermal efficiency of 35·2%, reducing, due to miscellaneous losses to 21%. Combining these results, table 2 is obtained.

Since the condensing station has no useful heat output, it would be necessary to install a heat generating station to produce the 63 units of heat provided by the combined station. Allowing a boiler efficiency of 84%, the heat input would be 75 units, and thus the separate stations would use 43% more fuel than the combined station.

### *Economy*

It is possible to derive a simple expression for the economy to be expected from a combined station, and Mr. Carrothers does this in terms of $T_1$, $T_2$ (as already defined, for a combined station), $T_3$, the absolute temperature

at which heat is discarded in a separate electric station; e, the proportion of heat available for conversion to electricity and useful heat output; and r, the efficiency ratio of the turbines.

The ratio of the total station heat input for a straight electrical condensing station to that for a combined heat-electric station is $\frac{T_1-T_2}{T_1-T_3}$ if both are producing the same amount of electricity. The corresponding ratio for a straight heat station is $1-r\frac{(T_1-T_2)}{T_1}$. Adding these expressions the ratio for the two stations to that of a combined station is obtained as

$$\frac{T_1-T_2}{T_1-T_3}+(1-r)+\frac{rT_2}{T_1}$$

With $T_1$, $T_3$ and r are considered as constants, and $T_2$ as a variable, the ratio is a linear function of $T_2$, equal to 1 for $T_2=T_1$, and to $\frac{T_1}{T_1-T_3}+1-r$ at $T_2=0$. Inspection of the curves derived for practical values of the parameters between $r=1$ and $r=0{\cdot}6$ shows that the ratio increases if r decreases; this is so because in combined generation the work reconverted to heat due to turbine friction has a useful function. The further interesting fact emerges that under the most probable operating conditions the fuel used for separate generation is about 45% higher than that used for combined generation of the same amounts of heat and electricity.

It is thus possible to make the following approximate rule:—

Every ton of coal used for combined generation gives a saving of 9 cwts. of coal used in separate generation.

TABLE 2. HEAT INPUTS COMBINED AND CONDENSING STATIONS COMPARED.

| | Combined heat electric station | Condensing station with same heat input as combined stations | Condensing station with same electrical output as combined stations |
|---|---|---|---|
| 1 | 2 | 3 | 4 |
| Heat irretrievably lost to flue gases, radiation, etc. | 16 | 16 | 11 |
| Heat converted to electrical power | 21 | 31 | 21 |
| Heat leaving generating plant in circulation water | 63 | 53 | 36 |
| Total Input | 100 | 100 | 68 |

Or, stating the same rule in another way:—

Combined generation gives a saving of 31% of the fuel which would be consumed in separate generation of the same amounts of heat and electricity.

## Economics

The consequent saving is certainly worthy of attention, but the attractiveness of the reduction in fuel consumption must depend on the magnitude of the expenditure on fuel as compared with other operating expenses. If generation was for sale to the public any saving would be important, but in industry the question of operation of a combined station is a complicating problem. In this paper it is only considered for the simplified case of an industrial undertaking using electricity for power, lighting and general purposes, and heat mainly for process applications, but also for space and water heating.

If separate generation is in force, the staff of the generating station also maintain and operate electrical equipment in the works; similarly for the heat station. Any change to combined generation will produce a staffing problem ranging from the redundancy of most of one of the station groups on the one extreme, to the creation of a third staff, in a co-ordinating capacity, at the other.

The demand for electricity does not, as a general rule, coincide with the demand for heat, and to balance the requirements either hot water accumulators are installed, or the electrical system is connected to an outside network. A practical example, dealt with in the paper, is the installation at the Lune Mills works of Jas. Williamsons, described in the ELECTRICAL TIMES of 13 October, 1949.

## Production

Although the design of a combined system is frequently costed on fuel and labour, actually production is often affected, and for the type of undertaking for which combined generation is particularly applicable, production takes first place in the minds of the personnel. It is important to remember that the combined station is unlikely to be so certain from the continuity aspect and so efficient in detailed operation as the two separate stations. Certainly the designer of a combined system may be able to provide against the risks of disturbing production, but in doing so he will probably use up much of the saving on fuel which the station is designed to ensure.

## Operation

From the operating viewpoint the combined station presents a difficult and complicated task, as can be imagined from a consideration of the complexities of a straight condensing station. Obtaining maximum economy is likely to be a full time job on somebody's part. Whoever undertakes this work cannot do it justice if subjected to worries over the normal operation of power plant, neither can these normal contingencies receive adequate attention if the responsible staff have their interests diverted elsewhere.

# ELECTRICAL MACHINES

## *Code of Practice Reviews Installation and Maintenance*

IT is almost two years since B.S. Code of Practice C.P. 321-202 (1950)*, now published, was circulated in draft form for comment and it is interesting to speculate how much of this time was lost due to difficulties associated with printing, and how much time was usefully spent in considering the various alterations suggested and improving the drafting in the light of these and other considerations. Should anyone doubt the amount of careful work entailed, then I would suggest that they compare the draft with the final product.

NOTES ON WIRING by Megohm

As has been pointed out on former occasions, these codes never prescribe methods or ratings inferior to those of the I.E.E. regulations; on the contrary, they may in some respects be even more stringent and frequently are a pointer to some subsequent alterations when next the regulations are revised.

### *Scope, etc.*

The present code is one of the "Electrical Installations—General" group and deals with the items set out in the heading when operating at 650 V or less, including transformers having at least one main winding operating at this pressure, but excluding private generating plant and flameproof equipment, both of which are covered by other sub-codes. Useful cross-references are given linking up all associated codes and the relevant B.S. specifications proper, which latter comprise some forty separate items; so it is clear that considerable work has been entailed and the final result is a useful addition to one's reference library.

In the "Time Schedule" clauses is included the counsel of perfection that the main structural work, special foundation blocks, making good, etc., should be completed before the plant is installed or put into commission, as the case may be. How true this is—how infrequently is this good advice heeded. Have we not all experienced troubles and delays caused by plant dumped on a site quite unprepared to receive it with consequent damage from dirt and moisture? Suitable storage accommodation is an item well worth serious consideration, particularly for work on remote or inaccessible sites, and more attention should be given to this matter on large contracts taking a long time to complete.

### *Safety Precautions*

The question of isolating equipment from the supply and protection against faults or overloads has been given considerable attention. It is pointed out that the principle to be observed is that any device which purports to isolate an installation should do so without exception, but if this is not wholly possible clear instructions should be affixed to the apparatus in a permanent manner stating how this can be done. This latter condition will usually refer to control circuits, relays, pilot lamps, etc., which may not always be controlled by the main gear or by subsidiary emergency stop gear.

In connection with emergency stop gear, consideration has been given to the question of restarting after an emergency stop has been operated. As an example of this problem I once came across a motor-driven stacker belt-driven through a wall, with safety stop buttons outside the building and out of sight of the staff by the motor. On one occasion one of the loaders got caught up and the motor was promptly tripped out by his mate. Unfortunately, the man inside thought it was an overload trip and promptly started up again, though happily without any serious consequences in this instance. It is rightly pointed out that any such stop switch should not be self-resetting.

### *Maintenance*

Maintenance, under which heading we may include regular periodical testing and the replenishing of materials subject to waste, is dealt with generally and in connection with specific appliances. Protective paints and varnishes for example, should not be neglected if they show signs of deterioration, and whenever circuit breakers and similar devices have been in operation under fault conditions, the earliest opportunity should be taken to check them.

Machines should be blown out at regular intervals so as to keep their ventilating passages clear, and this also applies to many of the totally enclosed type which may be working in dusty atmospheres.

A warning against danger from explosive vapours is given and attention is drawn to a pamphlet published by H.M. Stationery Office (Form 1926—April 1941) which deals with precautions to be taken so as to render safe tanks and drums, etc., which may contain such vapours and for some reason or other are to be welded or exposed to a naked flame.

Finally, some tables are given as a guide when selecting cable sizes for motors working under different conditions.

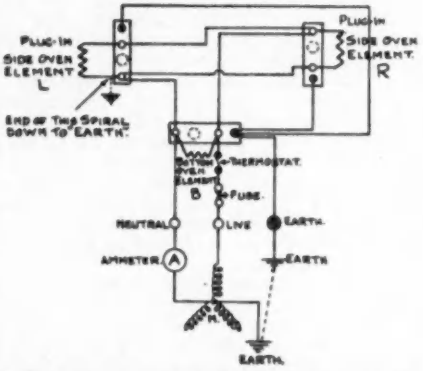
* "*Installation and Maintenance of Electric Machines—Transformers, Rectifiers, Capacitors and Associated Equipment.*" *Issued by the B.S.I., 24 Victoria Street, London S.W.1, price* 4s.

# PROBLEMS and PRACTICE

## In Engineering

### Oven Testing

WHEN a new thermostatically controlled electric oven (loading 2,200 W at 230 V) was switched on for test, the ammeter reading was approximately 2·5 amps. The two side and one bottom elements were removed and tested for continuity and loading and found o.k. On replacing the elements the ammeter reading was no different. Removing either B or R element slightly decreased the ammeter reading. With elements B and R in circuit but L removed, the ammeter reading increased to approximately 6 amps. On interchanging elements L and R a flash was observed to take place in the terminal cover of R element (originally L element). Inspection disclosed that the end of the spiral connected to one of the terminals had been making contact with the metal terminal cover of the element and, therefore, with "earth." Further investigation also showed that the ammeter was connected in the neutral side of the supply mains. The design of this particular make of oven demands that the side oven elements L and R be inverted if interchanged. In the original position, the elements were fed mainly via the "earth," which would appear to have had a lower impedance than that of the neutral conductor, or else the voltage between live conductor and neutral conductor was lower than that between the live conductor and

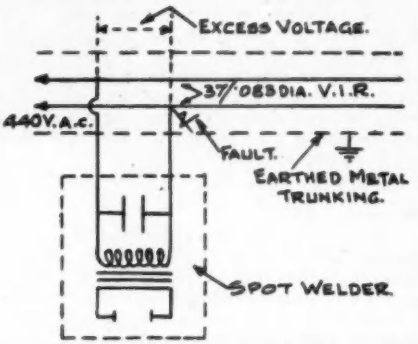



Oven connections, supply transformers, measuring instruments and the position of faults are all shown diagrammatically in the sketch

"earth," this explaining the very low ammeter reading. In the interchanged position of elements, the "earthed" terminal became the live terminal, thereby causing a short circuit fault to earth. If the oven had been given an insulation resistance test before applying a mains test, the nature of the fault would have been discovered. However, it is quite easy to be wise after the event.—*E. A. R.*

### Resonance Produces Tape Fault

ON being called to renew a 200-amp cartridge fuse in a main switch supplying a spot welding machine, it was found that the fault occurred at a tee joint on the main cable, which was encased in metal trunking. A small pin hole had burned its way through the two




Spot weld connection showing conditions under which perforation of tape occurred

layers of Empire and one layer of black insulating tape which surrounded the joint, and directly opposite a hole of similar dimension in the metal trunking obviously due to earth leak. The leak was put down to a very excessive voltage, due to resonance. The magnitude of the voltage being sufficient to break down the insulation of the joint in question. A very valuable lesson was learned of the need for very great care when taping joints in a circuit that comprises inductance and capacitance.—*W. A.*

### Fitting Tight Bearings

WHEN fitting new roller bearings on a 2·5 h.p. mechanical stoker motor, it was found that the bearings would only just enter on the shaft and in spite of all the force that was used, the bearings would not move further on the shaft. As further forcing might have been injurious it was decided to stop the job. Well, what was the next step to take? There were a number of suggestions which could be adopted, such as, filing a little on the shaft, turning the shaft down in a lathe or using emery paper.

However, another method was used as follows:—

The bearings in turn were rested for a very short time on a hot stove until they were quite warm, not too hot of course, and then removed with a piece of cloth (and really it was hardly believable considering the force that was at first applied without success). The bearings simply slipped on the shaft with practically no effort and the job was completed in a few minutes, no hammering or force being necessary.—*C. W.*

## Overload of Fan Motors

THE possibilities of causing overloads on fan motors is not always realised. Called up to investigate excessive heating of a 10 b.h.p. 1,440 r.p.m. motor in use for driving a fan by belt transmission, test was applied which indicated an overload of approximately 50%. On inquiry if the additional load could be accounted for, the user said, "All we have done is to increase the speed of the fan by 15%, and as the motor is specified for a continuous over- of 25%, there should be no undue heating." It was pointed out, however, that the power taken by a fan does not increase in the same ratio as the speed; but closely approached the cube of the speed. In practice it may be taken as the cube.

$$\text{Speed} = \frac{\text{normal speed} \times \%\ \text{increase}}{100} + \text{n. speed}$$

$$\text{In this case } \frac{(1{,}440 \times 15)}{100} + 1{,}440 = 1{,}656 \text{ r.p.m.}$$

$$\text{H.P. at increased speed} = (\text{increased speed} \div \text{normal speed})^3 \times \text{normal h.p.}$$

$$\text{Viz.: } (1{,}656 \div 1{,}440)^3 = \left(1{\cdot}15\right)^3 \times 10 =$$

Assume that the motor, under continuous operation, could take care of an overload of 25%: the maximum speed increased should not exceed 8%. If the speed is decreased the power also decreases as the cube. Perhaps the formula would be better expressed:—

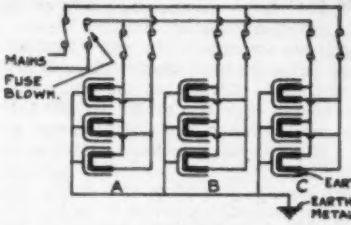
Power = (change in speed ÷ normal speed)$^3$ × normal power.

Another case of overload occurred later.

In order to carry out an urgent job some additional machines were added to a motor-driven line shaft. On account of the additional load the temperature of the driving motor approached the dangerous point. In order to carry on it was decided to resort to artificial cooling for the motor windings. A 1 h.p. smithy blower was put into commission for this purpose. After running for a few hours the main driving motor cooled down, but the fan motor burnt out. On investigation it was found that when the fan was in use as a smithy blower it discharged the air via a 2 in. delivery pipe. This pipe was removed thereby increasing the area of the discharge orifice. The increased volume of air delivered overloaded the fan motor.—*F. Mackintosh.*

## Three-Wire Distribution

THREE buildings were supplied from a three-phase, three-wire system. A and B buildings were complaining that their tubular heaters were not working, yet C building was working quite satisfactorily. A and B building fuses were in order, yet C had a blown fuse, and there the heaters were working. At first, this seemed




In addition to the mains fuse, a fuse to C was blown

a funny situation, but after testing I found that the main fuse had blown and that one of the heaters in C building had an earth on, plus a blown fuse, and that the heaters in C were working from phase to earth. You can quite imagine what the remarks were like when I stopped the supply in C building to repair the earth and what the people thought—A and B, no heaters working, yet he stops our heaters which are working. The situation was soon cleared up and everyone was happy. The sketch explains the fault.—*C. Taylor.*

## Two-way Switch Conversions

IN Figure 2 of last week's note on this subject the connection shown from the joint behind the block to the adjacent switch contact was included in error. Effectively it makes it impossible to switch off the lamp with the other switch contacts in the lower position.

## Static Electricity in Belting

THE generation of static electricity in belting is unavoidable in some circumstances. Discharging the belting through a metal comb in contact with it is to a certain extent effective, but it causes wear on the belt. However, if the belt pulleys are fitted with brushes bearing on the pulley faces, and connected with earth, the pulley will be kept at earth potential and the belt will discharge itself each time it passes round the pulley.

This method avoids any wear on the pulley belt, prevents any electrical potential being built up, and also stops any consequent flow of current passing to earth via bearings and thus causing pitting of the bearing metal and discoloration of the oil.—*W. E. W.*

*Contributions to this feature, dealing with specific problems and items of interest to practical engineers are welcome, and will be paid for at our standard rates. Items should be brief, and preferably accompanied by diagrams or sketches, which will be redrawn for publication.*

*Contributors should state whether or not their names are to be published if their notes are accepted.*

# OVERSEAS NEWS

### *Diesels for Airports*

The Federal Government has ordered 231 diesel electricity generators as emergency power units for Australian airports. The Air Minister (Mr. White) has authorised the placing of orders in Australia and Britain at an estimated cost of £478,000. For the supply of 200 kW generators, required for emergency power at Australia's international transmitting stations at Richmond and Darwin and also for the airports at Darwin, Mascot, Essendon and Perth, the department has accepted the tender of the English Electric Co. No Australian firm tendered for the heavier generators, but for the supply of 168 units of 5 kW and 2 kW, the tender of G. G. Martin and Co., of Perth, has been accepted.

### *Equipment for Newcastle*

In order to furnish a supply to Courtaulds' proposed new factory at Tomago, the Newcastle (N.S.W.) City Council has this month authorised the acting electrical engineer and manager of the Electric Supply Department, Mr. Nash, to call for tenders for the necessary equipment, estimated to cost £30,000. Equipment needed includes o.h. mains, switchgear and transformers. Some 33 kV switchgear and transformers are also needed for the extension to the Boolaroo area.

### *Snowy River Progress*

Information on the progress of the Snowy River hydro-electric project was given earlier this month by Mr. Hudson, Commissioner of the Snowy Mountains River Authority. Reconstruction of 60 miles of roads had been begun, he said, and new access roads built, while staff accommodation had been got under way. Preliminary work had also been started at Adaminaby Dam. A technical and administrative staff of more than 120 had been set up, and there were about 500 workers in the field, to be increased eventually to 9,000. Although staff is at present under canvas, proper housing is to be established to meet winter conditions.

### *Victoria's Extensions*

Rural extensions by the State Electricity Commission of Victoria during 1949 were a record. A further 341 substations were installed in country and provincial areas, and 33 in the Metropolitan district. Despite shortage of materials 50,000 new consumers have been connected by the Commission in the past three years, compared with 35,000 between 1936 and 1939.

### *Queensland Plan*

The Dalby Town Council, Queensland, is to borrow £22,500 to provide additional generating plant. Such is the local demand, that in the half year ended December 31, the current generated exceeded the estimated amount for the whole of the financial year.

### *A Canadian Grid?*

Plans for the establishment of a power network connecting the extreme ends of the provinces of Quebec and Ontario, were referred to by Mr. J. Wilson, president of the Shawinigan Water and Power Co. in a review of hydro-electric development in Canada. Progress is being made, he declares, in co-operative planning for interconnecting all the power systems based on the Niagara, the Ottawa, the St. Lawrence, the Gatineau, the St. Maurice and Saguenay Rivers. These plans envisage an ultimate co-ordinated transmission grid or network stretching from Windsor in Western Ontario, through the cities of Toronto, Ottawa, Montreal, Trois-Rivieres, Shawinigan Falls and Quebec to the Saguenay. Into this system, with standard frequencies and equipment, plants will deliver power, taking advantage of the flow characteristics of these rivers.

### *New Changer Station*

The large new frequency changer station at Sudbury was formally opened by Mr. R. H. Saunders, chairman of the Hydro Electric Power Commission of Ontario, a few days ago. The station converts 25 cycle power to 60 cycles and vice versa.

### *Canada's Generation Up*

A record total of 46,673 million units were generated by Canada's central power stations during 1949, as against 44,568 million units in 1948. In December, output of electric energy amounted to 4,039 million units compared with 3,694 millions in the same month of 1948.

### *E.C.A. for Quebec?*

Electrical contractors in Quebec are planning to form a professional corporation, according to a report from the local Retail Merchants Association. A brief which envisages, *inter alia*, the creation of such an organisation is to be presented during the current session of the Provincial legislature.

### *India Wants Data*

To compile information for use in conjunction with future projects, the Central Designs Organisation, Central Water-power, Irrigation and Navigation Commission of the Government of India, wishes to obtain data from manufacturers of equipment for hydro-electric stations. Apart

from civil engineering equipment, the Commission desires catalogues and other information of water turbines, generators, switchgear and power house accessories, sluices and gates, etc. Material should be forwarded to the C.W.I.N.C. at Keeling Road Barracks, New Delhi.

### *N.Z. Cable Factory*

A new cable manufacturing concern, with the title, Associated British Cables, Ltd., is being established at Sockburn, Christchurch, N.Z., by a group of British cable firms, all members of the C.M.A., it is reported. A factory of about 40,000 sq. ft is being prepared, and production of a variety of types of cables is expected to start this year. Representatives of the British firms involved are now in New Zealand completing the arrangements. Some key men are to be sent out from England.

### *Extension for King's Wharf?*

Approving the recommendation passed at the conference of the Power Supply Authorities' Association, which we reported last week, the New Zealand Cabinet has now agreed that Preece, Cardew and Rider should be approached to ascertain whether they would be willing to send a representative to assist the State Hydro-Electric Department in formulating plans for an additional 30,000 kW steam turbo-alternator at King's Wharf power station, Auckland. (Preece, Cardew and Rider were the consultants when the existing steam plant was installed at King's Wharf. They also act for the Auckland Electric Power Board.)

### *Transformers for Orlando*

At the recent meeting of the Johannesburg City Council, the tender of the British Thomson-Houston Co., Ltd., for the supply of five 40,000 kVA generating transformers, and other house transformers, at a cost of £289,876, was accepted. These transformers are for the three stages of the 1949/55 development programme for Orlando power station. The turbo-alternators are being supplied by the General Electric Co., Ltd., as we recorded last week. The first two 30 MW sets are planned for operation in 1952, with two further similar sets being brought into use in 1953 and the final 30 MW set in 1954-5.

### *Another Jo'burg Station?*

In addition to arranging for extensions to the Orlando generating station, the Johannesburg City Council is now contemplating how the electricity undertaking can be further enlarged—either by erecting another power station or by taking a bulk from another source—to meet post-1955 needs. The Tramway and Lighting Committee recently voted that £2,500 be spent on drawing up plans for a new 100,000 to 200,000 kW power station. Should the council build its own station it will probably be sited north-east of the city in the vicinity of Lombardy.

### *A Cape H.E. Scheme*

The Ceres Town Council, Cape Colony, has received notification from the Provincial Administration sanctioning its hydro-electric scheme. Under the scheme a dam 70 ft high is to be constructed on a tributary of the Dwas River, and water will be drawn from a mountain range with one of the heaviest average annual rainfalls in the Union. The power station is to be erected 1½ miles from the dam, the turbines utilising a fall of 500 ft. The turbines are to be supplied by a British firm, it is stated.

### *Congo Plans*

In the scheme for the electrification of the Belgian Congo, the Belgian Colonial Council recently approved the setting up of two companies whose duty it will be to construct a dam on the River Tshopo, near Stanleyville, and distribute power. One company—Societe des Forces Hydro-Electriques de l'Est de la Colonies—with an initial capital of 30 million Belgian francs, will do the civil engineering work, while the other—an electricity company—will handle distribution of power. The latter concern will have a capital of 45 million Belgian francs, of which approximately 60% is to be privately owned and the remaining 40% subscribed for by the State.

### *Nigerian Plans*

In anticipation of an increased demand from the tin mining industry, plans have been made by the Nigerian Electricity Supply Corporation, Ltd., for the erection of additional generating plant. It is proposed to build a new 4,000 kW hydro-electric station to be named Jekko No. 2, a short distance down the river from the existing Jekko Falls No. 1 station. Orders have already been placed with the British Thomson-Houston Co., Ltd., for the alternator and switchgear, with Boving and Co. Ltd. for the turbine, and the South Durham Iron and Steel Co. for the pipelines. Consulting engineers for the project are Mackness and Shipley. The inauguration of this new station will provide an interesting utilisation of the river, for three stations will then be operated from the same power source. At present the Kurra Falls station passes water on to Jekko No. 1 station, which in turn will pass it on via a pipeline to Jekko No. 2. All three stations will be situated within a distance of six miles.

### *New York's Proposal*

In its annual report, published this month, the New York State Power Authority again urges the swift development of the St. Lawrence project and eventual expansion of hydro-electric facilities at Niagara Falls. The presens U.S. power facilities at Niagara Falls are operated by a company. The Authority has now recommended "public" redevelopment, and is opposed to "increased use of Niagara water under licence to private interests."

# PERSONALITIES

## In the Industry

District engineer since vesting day, **Mr. A. Durbridge** has been appointed manager for the Harrow district, Northmet sub-area of the Eastern Electricity Board, in succession to **Mr. N. Axford** who has now taken up similar duties at Plymouth, as we noted in our December 15 issue. Mr. Durbridge gained early experience with the Reading undertaking before joining the old Harrow E.L. and P. Co. in 1927 as engineer and assistant to the manager. When that concern was acquired by the Northmet Power Co., he was redesignated assistant district superintendent.

**Mr. A. Durbridge**

At the beginning of next month, **Mr. E. Bright,** of 37 Lingwell Avenue, Leeds, takes up his new position as technical sales representative to Machine Tool Electrics Ltd., for Yorkshire. He has served with the Igranic Electric Co. Ltd., for nearly 25 years, for some time as chief test engineer, and, since 1943, as sales engineer at their Leeds office.

Two changes in their Lamp and Lighting personnel are announced by the British Thomson Houston Co. Ltd. **Mr. E. R. Seaden,** B.SC.(Eng.), formerly at the company's Birmingham office, has been given the post of senior lighting engineer at the London district office. At the Birmingham office, **Mr. H. B. Mellor,** ASSOC.I.E.E., has been nominated senior lighting engineer—Midlands. Mr. Seaden served his apprenticeship with a London firm of electrical engineers, with which he ultimately became senior design and development engineer. After service with the Admiralty during the last war, he rejoined the firm, subsequently being appointed manager and chief engineer of a subsidiary firm. He joined B.T.H. in December, 1948, as senior engineer, Birmingham district office, lighting section. Mr. Mellor, who now joins the Birmingham office, was previously senior lighting engineer at the B.T.H. Leeds office. He served his apprenticeship with a firm of electrical engineers in Oldham and Manchester.

**Mr. E. R. Seaden**

**Mr. H. B. Mellor**

To mark his completion of 50 years service in the electricity supply industry, and his forthcoming retirement in April, his colleagues with the South Weston Electricity Board recently presented **Mr. W. Knapp,** senior executive officer at Tavistock, with a wrist-watch and a cheque. Prior to vesting day, Mr. Knapp was general manager to the West Devon Electric Supply Co., Ltd.

An informal lunch was given by his colleagues on Friday last to **Mr. E. W. Tole,** A.M.I.E.E., to mark his retirement. Since vesting day he has been senior executive officer of the South Western Electricity Board for North Somerset—an area now divided between the Bristol, Bath and Weston-super-Mare districts of the Bristol and North Somerset sub-area. Mr. Tole served an apprenticeship with the St. Helen's Cable and Rubber Co., later serving with the Nuneaton Corporation and the London Underground Railways. In 1913, he was appointed engineer and manager at Bower Ashton, of the North Somerset Electricity Supply Co., which was controlled by Christy Brothers, Ltd. Incidentally, 88-year-old **Mr. Frank Christy,** of the latter concern, travelled especially to Bristol to make a presentation to Mr. Tole, who received a wireless set and an occasional table from his colleagues. On behalf of the Board, **Mr. H. Midgley,** M.SC., M.INST.C.E., M.I.E.E., deputy chairman, presented Mr. Tole with an electric chiming clock.

**Mr. E. W. Tole**

The Council of the British Electrical and Allied Industries Research Association for the session 1950/51 is as follows:—

| | | |
|---|---|---|
| Mr. H. Astbury (chairman) | ... | Manufacturers' Associations (B.E.A.M.A.) |
| Mr. F. H. Bramwell | ... | Manufacturers |
| †Mr. J. K. Brown... | ... | Manufacturers' Associations (B.E.A.M.A.) |
| Mr. J. S. A. Bunting | ... | Manufacturers' Associations (C.M.A.) |
| Mr. H. F. Carpenter | ... | B.E.A. |

| | |
|---|---|
| Mr. B. G. Churcher | Manufacturers' Associations (B.E.A.M.A.) |
| *Mr. W. N. C. Clinch | B.E.A. |
| Mr. C. M. Cock | British Transport Commission |
| †Mr. A. Collins | Manufacturers' Associations (B.E.A.M.A.) |
| Mr. A. R. Cooper | B.E.A. |
| †Sir John Dalton | Manufacturers' Associations (C.M.A.) |
| Mr. L. J. Davies | Manufacturers' Associations (B.E.A.M.A.) |
| †Mr. J. Eccles | Area Boards |
| Mr. N. R. Elliott, O.B.E. | Area Boards |
| *Mr. T. E. Goldup | I.E.E. |
| Sir John Hacking | B.E.A. |
| *Mr. O. W. Humphreys | Manufacturers' Associations (B.E.A.M.A.) |
| Mr. P. V. Hunter, C.B.E. | I.E.E. |
| Mr. R. Lee | Co-option |
| †Mr. C. W. Marshall | B.E.A. |
| Mr. C. T. Melling | Area Boards |
| Mr. H. H. Mullens | Area Boards |
| Mr. H. Nimmo | Area Boards |
| Dr. W. G. Radley, C.B.E. | Co-option |
| Dr. H. Roxbee-Cox | D.S.I.R. |
| *Mr. W. S. Sawtell | Area Boards |
| Mr. C. A. Spencer | D.S.I.R. |
| †Mr. R. S. J. Spilsbury | D.S.I.R. |
| †Mr. T. M. H. Stubbs | Manufacturers' Associations (B.E.A.M.A.) |
| Mr. F. C. Winfield | North of Scotland Hydro-Electric Board |
| Lt.-Col. E. H. E. Woodward, C.B.E. | B.E.A. |

*New elections. †Retired by rotation and re-elected.

For the post of development engineer in the chief engineer's department of the North Western Electricity Board, **Mr. F. G. Copland,** ASSOC. I.E.E., ASSOC.I.MECH.E., has been selected. Since 1947 he has been employed by Lever Brothers, Port Sunlight, Ltd., initially as assistant electrical engineer (lighting), and for the past eighteen months as distribution engineer. Previously he was assistant to the chief engineer of Lewis Ltd., Liverpool, for about a year, after spending about seven years as assistant chief engineer to Ashanti Goldfields Corporation Ltd., on the Gold Coast. Educated at Wallasey Grammar School, he gained technical education at the University of Liverpool, and afterwards served with the Yorkshire Electric Power Co., the Mid-Cumberland Electricity Co., Isle of Man Electricity Board, and Norwich Corporation Electricity Department.

Mr. F. G. Copland

After an extensive tour of Australia and New Zealand, **Mr. H. S. Aspinall,** M.I.MECH.E., general export manager of the English Electric Co. Ltd. and director and export manager of the English Electric Export and Trading Co., is now on his way back to this country, where he is due early next month.

**Manager of the Wolverhampton branch of Newey and Eyre, Ltd., Mr. D. Ashton has been elected a director of the company.**

Mr. A. E. McConnell

Mr. S. McCracken

Manager of the Belfast office of the Metropolitan-Vickers Electrical Co., Ltd., for the past 23 years, **Mr. A. E. McConnell,** M.B.E., has recently retired and has been succeeded by **Mr. S. McCracken,** M.I.E.E. Mr. McConnell served an apprenticeship with the firm in 1903, later entering the Plant Sales Department. Afterwards, he took charge of orders in the Motor Sales Department prior to transferring to the Export Department. Following war service, he spent a period as senior technical assistant in the Contracts Department before going to Belfast in 1927. His successor, Mr. McCracken, was also an M.V. apprentice, afterwards becoming senior tester on Dynamo Test. From 1925, he was engaged on the company's erection work in India, Burma, Singapore, Russian Turkestan, Central Asia and Western Siberia. He has been at the Belfast office since 1934. He is also vice-chairman of the Northern Ireland Centre of the I.E.E.

For the position of lighting engineer the Sheffield Watch Committee has recommended the appointment of **Mr. J. Chisholm,** who now holds a similar post at Greenock.

Just returned from an extended business tour of the West Indies is **Mr. S. L. M. Barlow,** ASSOC. I.E.E., chairman and managing director of Barlow and Young, Ltd.

Henry Wiggin & Co. Ltd. announce that **Mr. John Hitchcock,** B.SC., who since 1946 has been personal assistant to the managing director Mr. I. A. Bailey, has now been appointed to the newly created post of assistant managing director.

**Mr. G. P. Tinker** has been appointed managing director of Birlec Ltd. in succession to the late Mr. A. G. Lobley. Mr. Tinker, a director of the firm since 1946 has been a member of the executive staff of the company since its formation in 1927.

Last week **Mr. V. N. Jolliffe,** A.M.I.E.E., electrical engineer, South Wales Docks, retired from the service of the Docks and Inland Waterways Executive. He is succeeded by **Mr. E. R. Radway,** A.M.I.E.E., A.M.I.MECH.E., A.M.I.STRUCT.E. To mark his retirement, Mr. Jolliffe has been presented with a fireside chair and an inscribed album.

Babcock and Wilcox, Ltd., have appointed their general manager, **Mr. Hector McNeil**, B.Eng., M.I.Mech.E., M.I.E.E., a director.

Fully recovered from his wounds, we are glad to hear, **Mr. J. F. Shipley**, M.I.E.E., returned from Siam to this country last week end.

The Ministry of Fuel and Power has accepted the resignation of **Councillor I. R. Thomas**, a part-time member of the South Wales Electricity Board, who has been nominated as a candidate in the forthcoming general election.

### OBITUARY

The death occurred recently of **Mr. W. T. Dalton**, M.I.E.E., aged 70, formerly chief engineer of the Newcastle-upon-Tyne Transport and Electricity undertaking from which position he retired in 1943. He joined the Newcastle undertaking in 1901 as assistant electrical engineer, becoming chief engineer in 1926.

We note the death on February 12, of **Mr. J. W. Ronchetti**, aged 65, who, since April, 1948, has been senior assistant to the chief generating engineer (operation) of the North Eastern Division, B.E.A. He first joined the Cleveland and Durham Electric Power Co., in 1912, and has since been closely associated with power station engineering development on the north-east coast with the North Eastern Electric Supply Co., with which he eventually became supervisor of the Economy Section.

We note the recent death of **Mr. E. B. Percival**, A.M.I.E.E., aged 66, who was resident engineer to the Wellingborough Electric Supply Co., Ltd., from 1921 until his retirement in 1937.

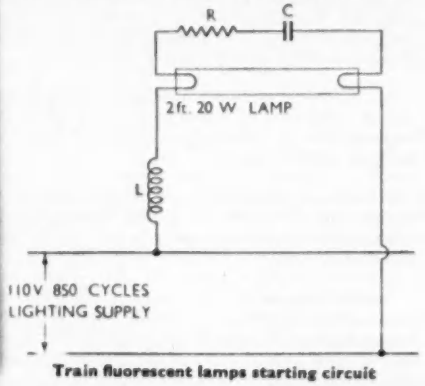
**WILLS.**—**Mr. S. D. Firth**, chairman of F. C. Blackwell and Co., Ltd., left £38,541 (£37,761 net value).

**Prof. C. L. Fortescue**, O.B.E., M.A., M.I.C.E., M.I.E.E., emeritus professor of electrical engineering, Imperial College of Science and Technology, left £18,823 (£18,694 net value).

**Mr. B. Higgins**, secretary of the London Division, B.E.A., left £4,307 (£4,213 net value).

## TRAIN LIGHTING

FLUORESCENT lighting in the new "R" class London Transport rolling stock is to operate from an 850 c/s supply, so becoming the most extensive railway installation of this type in the country, according to the General Electric Co., Ltd., who are supplying the necessary equipment. The 110 V h.f. generators will normally supply two cars, although they are rated to deal with the 72 2ft. 80 W lamps installed in three such coaches. Power factor correction is provided at the generator.




**Train fluorescent lamps starting circuit**

Rotation of the ceiling mounted lamp fitting will give access to the control gear for each lamp, which consists of a series choke, a starting capacitor and a starting resistance. Arranged as shown in the diagram, these components form an LCR series circuit with a resonant frequency near to that of the supply. The voltage developed across C thus exceeds normal supply voltage, and is sufficient to start the discharge. Resistance R acts to limit the resonant voltage, and so prevent the discharge commencing before the filaments are safely heated.

## NEW B.T.H. TRACTION FILM

ON Monday of this week, through the courtesy of the British Thomson-Houston Co. Ltd., we were enabled to see Part III of their film "Electric Traction" which has just been completed.

Part I, "Battery-Electric Vehicles," and Part II, "The Trolley-Bus," were demonstrated in September, 1948, at Nottingham, in connection with a demonstration run of a City of Nottingham trolley-bus fitted with the latest B.T.H. design of controlled acceleration (see ELECTRICAL TIMES, Sept. 30, 1948, page 389). The present film deals with multiple unit electric trains.

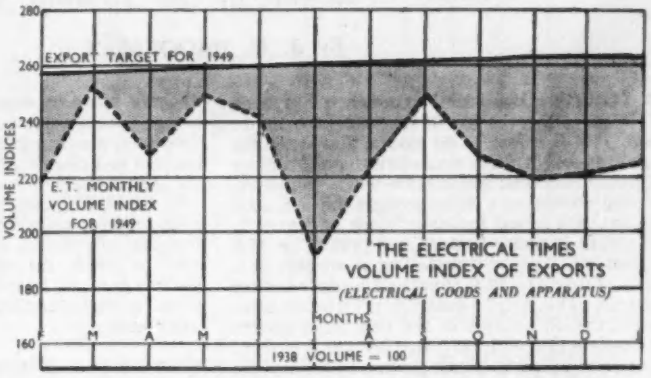
Primarily intended for overseas prestige and sales purposes, the film gives a general review of the application of multiple-unit electric traction to moving dense crowds at high average speed, commencing with the inception of underground railways with the City and South London Tube, developing the theme with interesting shots of electric railways in Britain, Australia and India, and finishing with the "Brighton Belle" express. Technicalities concerning control gear are kept short and simple, the modern pneumatic cam-operated controller gear being illustrated by means of animated diagrams which, as in the case of those in the first two sections of the film, leave nothing to be desired in clarity.

The film is being produced in 35 mm and 16 mm sizes.

# EXPORTS AND IMPORTS

**EXPORT VOLUME INDEX**

**Trade returns for the first month of 1950 show that £6,436,894 was the value of the electrical goods and apparatus exported during that period. This is equivalent in volume to 226% of the 1938 achievement, and maintains the quantity reached by this section of the electrical industry in the last few months. It is, however, well below the most recent export target figures available.**




OUTPUT of electrical goods exported during the month of January last returned to a more normal level after the seasonable Christmas period decline. Of particular interest is the value of generators of less than 200 kW capacity, with a figure of £1,123,036, as against a sum usually about a quarter of a million pounds. The total value of convertors, transformers, rectifiers, etc., exported, also reached a record figure for the month. In the total for cooking and heating appliances, electric irons accounted for £31,423. On the receiving end, Canada took electrical goods valued at only £88,465 (approximately only 50% of the December total), compared with £1,354,420 by Australia and £1,144,753 by India.

| Description | Exports Value Month of January | | | Imports Value Month of January | | |
|---|---|---|---|---|---|---|
| | 1948 | 1949 | 1950 | 1948 | 1949 | 1950 |
| | £ | £ | £ | £ | £ | £ |
| Telegraph and Telephone Wires and Cables— | | | | | | |
| Submarine | 73,489 | 49,327 | 41,097 | 18,740 | 3,629 | 30,589 |
| Other | 422,174 | 536,070 | 737,660 | | | |
| Rubber Insulated | 450,695 | 646,350 | 273,401 | | | |
| Insulated, other than Rubber | 635,243 | 1,100,897 | 811,621 | | | |
| Wireless Apparatus, including Valves | 1,556,702 | 1,056,699 | 1,183,725 | 42,503 | 69,537 | 101,103 |
| Telephone and Telegraph Apparatus | 749,576 | 1,333,108 | 1,256,287 | 2,228 | 8,099 | 11,356 |
| Electric Lighting Appliances, Accessories, Fittings and Parts:— | | | | | | |
| Bulbs and Discharge Lamps | 140,388 | 160,284 | 172,654 | 7,469 | 11,865 | 23,667 |
| Other Descriptions | 447,618 | 512,547 | 327,557 | 9,759 | 5,203 | 33,211 |
| Batteries (primary) and parts | 39,524 | 98,560 | 80,823 | — | — | — |
| Accumulators, Portable | 207,659 | 223,132 | 248,343 | — | — | — |
| ,, Stationary | 38,884 | 46,254 | 37,919 | — | — | — |
| ,, Parts and Accessories | 59,735 | 64,508 | 80,993 | — | — | — |
| Electrical Cooking and Heating Appliances | 292,180 | 314,979 | 209,482 | — | — | — |
| Ammeters, Voltmeters, etc., and Parts | 89,671 | 99,567 | 103,898 | 14,070 | 24,809 | 31,445 |
| House Service Meters | 225,026 | 186,937 | 90,896 | | | |
| All Other Instruments | 52,832 | 62,855 | 98,791 | | | |
| Electro-Medical Apparatus | 25,673 | 39,419 | 36,125 | | | |
| X-Ray Apparatus, etc. | 64,835 | 104,479 | 40,349 | 40,760 | 26,307 | 19,592 |
| Insulating Materials | 161,047 | 190,873 | 159,062 | — | — | — |
| All Other Articles | 380,331 | 477,901 | 446,211 | 86,417 | 55,069 | 139,190 |
| TOTAL OF GROUP | 5,713,282 | 7,314,483 | 6,436,894 | 221,946 | 204,518 | 390,153 |
| Electrical Machinery:— | | | | | | |
| Generators (not exceeding 200 kW) | 235,409 | 677,007 | 1,123,036 | 124,753 | 15,431 | 18,259 |
| ,, (exceeding 200 kW) | 211,647 | 478,628 | 170,517 | | | |
| Parts | 229,174 | 208,388 | 143,263 | | | |
| Motors | 555,219 | 1,009,616 | 777,818 | 43,806 | 42,542 | 49,003 |
| Convertors, Transformers, Rectifiers, Motor Control Gear, Switchgear, other machinery | 1,092,040 | 1,487,467 | 2,036,947 | 4,070 | 8,743 | 13,053 |
| Fans, Electrically and Power Driven | 97,268 | 154,216 | 178,378 | — | — | — |
| Vacuum Cleaners or Electrically Operated Appliances | 150,059 | 241,863 | 186,577 | 59,672 | 18,858 | 6,416 |
| TOTAL APPLIANCES AND MACHINERY | 8,284,098 | 11,571,668 | 11,053,430 | 454,247 | 290,092 | 476,884 |

# Problems in Domestic Installation Work

## *Some Criticisms of the 13-amp Socket*

By J. G. BROOKMAN

NOW that two years' experience has been gained in the use of fuses and sockets to B.S. 1361-3, there is no doubt that extended applications of these accessories could further simplify domestic installation work. However, wiring contractors have received the B.S. 13A socket with mixed feelings. Many appear only to utilise it under protest and prefer the 15A round pin type, still installing re-wirable pattern fusegear and multi-way distribution boards. This article does not pretend to catalogue the advantages of the ring main system in conjunction with cartridge fuses as a basis of simple installation work, but assumes they are accepted by those engineers who have given thought to the subject. There is no doubt that greater convenience to the consumer is gained, at less overall cost, by a judicious use of these post war innovations. None the less, certain difficulties present themselves.

The most common criticism of the B.S. outlet is its non-adaptability in spite of the original intention that this was to be an all-purpose socket. The reason for this lack of adaptability is simply that insufficient outlets are installed, as specifications so often call for "one power point per room." To overcome this shortcoming, a 2- or 3-gang multiple outlet, into which two or more appliances could be plugged, is required. This end is only achieved at present by the clumsy method of installing single sockets in adjacent positions. Moreover, a multi-way adaptor, fused internally at 13A should not be difficult to manufacture, and would avoid the improvisations sometimes met with, such as a length of flexible cord leading from a 13A plug to a 15A socket, into which is plugged an adaptor.

### *Further Relaxation Justified*

It is also felt that further relaxation is justified of the regulations covering the installation of 13A sockets. Anomalies in the 1946 amendments to the I.E.E. regulations permit certain cables to carry greater currents than those permitted in the appropriate tables. For instance, 7/·036 may, under given conditions, be accepted as a 30A cable.

As a 7/·029 ring may not be protected by a fuse larger than 30A presumably 7/·036 could feed a ring located at a distance from the mains intake—as, for instance, in a large house. In this case the 7/·036 may well be supplying ten sockets, diversity being assumed. At present, however, 7/·036 apparently may not feed more than four sockets. This question of the number of socket-outlets per sub-circuit appears more to rest upon the size of cable rather than the number of sockets. A cartridge fuse will, according to its rating, restrict the current in a circuit, and consequently provided the fuse is rated to the cable (i.e. 5A for 3/·029, 15A for 7/·029, 30A for 7/·036 or for a 7/·029 ring) no more current will flow in the cable than the fuse will permit. Provided sufficient allowance is made for diversity the number of sockets need not be restricted, except that spurs from a main circuit should be kept to a minimum.

### *Cartridge Fuses*

It is felt that the use of cartridge fuses, even only of the medium rupturing capacity called for in B.S. 1361-2, have such a rapid operating time compared with open wire-type fuses that wiring regulations could well be drafted to incorporate circuits using cartridge fuses only. The need for 3A, 7A or 13A fuses in the plug confuses the consumer, and this careful matching of fuses with load is not necessary. Faults on domestic appliances are generally short circuits or earths, or rapidly develop into one or other of these; a 13A fuse operates under these conditions in approximately one-hundredth of a second.

Most, if not all, supply authorities' terminations include cartridge type main fuses. A consumer's main fuse, if of re-wirable pattern, is unlikely to discriminate against the quick-acting cartridge under severe fault conditions and the inconvenience arises of awaiting the authority to call to renew their fuse. Even if distribution boards on the lines of the E.D.A. service unit are not installed, switchfuses are available incorporating 15A, 30A or 60A cartridges. (A demand exists for the extension of this range to one of 5A capacity.) There is no reason why contractors installing additional circuits should not incorporate cartridge fusegear instead of extending the obsolescent re-wirable type.

The opportunity should also be taken wherever possible to tidy the assortment of iron-clad switches so often seen, by replacement by one combined switch-fuse distribution unit.

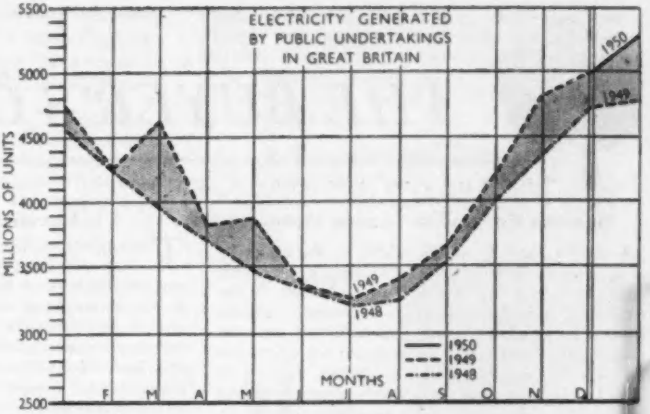
The public generally is very much in the dark over these new developments in wiring technique. Perhaps when the winter is past, with its constant reminder to "keep off the peak," some judicious national advertising could bring out the more important aspects of present-day installation accessories. The industry as a whole should benefit.

**UNITS GENERATED**

During the month of January, 1950, a total of 5,275 million units was generated in stations under the control of the B.E.A. and the North of Scotland H.E. Board. The corresponding figure last year was 4,757 million, so there has been an increase of 10·5%.

Of the total quoted above, 5,139 million units were generated in thermal stations, while the hydro-electric output was 136 million units. These figures include 10 million units generated in waste heat plants.

Energy sent out during the month was 4,988 million units, 94·7% of that generated




# POWER SUPPLY IN JANUARY

AFTER December's record spurt in power plant commissioning, it is not surprising to discover that no new plant was added to the B.E.A. installed capacity during January. The North of Scotland H.E. Board has added 1 MW of plant to its system, but details are not yet available. Since there is no more plant to describe, an opportunity is afforded for a closer look at the month's generating figures than is usually possible.

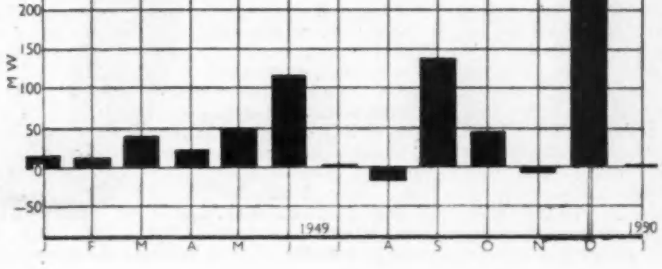
## *Generation*

For the B.E.A. the month's achievement was another record, both in energy generated and sent out. Steam stations were responsible for 5,087 million units, while water power stations produced 54 million. In Scotland the improved water position made possible the generation of 82 million units, the highest monthly total since March of last year, and consequently the output from other forms of station could drop from 39 million units in December to 35 million.

Taking all public generating stations in Great Britain, 5,275 million units were produced. Some 12 million of this figure is attributable to oil engine generation, 9·8 million to waste heat plants, and 0·2 million units to the utilisation of heat available from refuse destructors. For steam raising, 3,040 thousand tons of coal are stated to be used, together with 91,000 tons of coke. In addition, some of the 6·7 thousand tons of oil consumed are also applied to steam plant.

## *Maximum Demand*

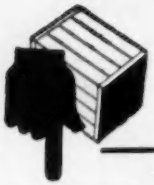
Recently published statistics show that the simultaneous maximum demand supplied from the Grid, plus the maximum demands from independent stations not connected to the Grid, totalled 11,033 MW in December. The highest figure reached last winter was 10,507, which was recorded in January, 1949.




**GENERATING PLANT**

At the end of January the installed generating capacity of the B.E.A. was 13,588 MW, the same as at the end of December. The North of Scotland H.E. Board total has increased by 1 MW to 326 MW and so there has been an overall increase during the past 12 months of 775 MW, or 5·1%.

The installed capacity, used for the purpose of this graph, should be distinguished from the output capacity. The installed capacity is the total m.c.r. of all the generating sets which are connected on both steam and electric sides and are suitable for use

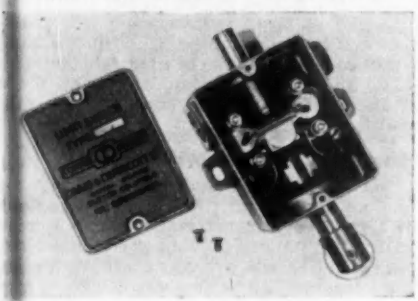


# THE BUYER'S COLUMN

## Remote Control for Loom Motors

AMONG new products added to the range of control devices made by Craig and Derricott Ltd., of Royal Works, Sutton Coldfield, is the "Crader" loom pilot switch. Intended primarily for the mechanical remote control of electric motor control gear, the switch is designed for operation by cam, lever, striking gear or beam. It may be wired for non-reciprocal switching and for the momentary operation of solenoid-actuated air valves, magnetic brakes and similar equipment. Sliding and toggle contacts are incorporated in the switch, which is rustproof finished throughout. With ¾ in. conduit entries on both sides of the stove enamelled die-cast case, the loom switch is available with spindle or roller head. Overall dimensions are 3⅜″ wide × 5¾″ or 5⅛″ high, according to type of head fitted.

**Below : The "Crader" loom pilot switch**



## Dust Extraction Problem Solved

IN addition to the "Staffa" 4 W.G. "Major" dust extractor made by Chamberlain Industries Ltd. of Staffa Road, Leyton, E.10, the company has now designed three more models to help solve the dust problems of the workshop.

Model DE4 twin portable unit is suitable for attachment to grinding, polishing and buffing machines. It comprises two centrifugal section paddle blade fans powered by a totally enclosed flange mounted double spindle motor. The fan housing and motor are mounted on a substantially compact steel cabinet equipped with a cast iron base. Dust is discharged through two linen fabric tubes each having a separate canister fitted with quick release mechanism. Model DE3 is a smaller edition of the DE4, having half the volumetric capacity, whilst the SE3 single portable machine is considered the answer to dust extraction from single ended machine tools.

## TV. Interference Suppression

The rapidly growing army of television viewers makes the problem of motor car ignition suppression of ever increasing importance. For many vehicles fitted with coil ignition, the simplest and most economic way is by inserting a suppressing resistor in the h.t. lead from the coil to the distributor. This can easily be carried out by the car owner himself by using the appropriate one of the two suppressors made by A. F. Bulgin and Co. Ltd., Bye Pass Road, Barking, Essex. These are moulded in polythene type material and are substantially waterproof. The resistance element is wire-wound and gives permanency of ohmic value and performance. One is a plug-in type and the other a screw-in type. Both cost 1s. 6d. retail, with a 50 per cent discount to all retailers for lots of 12 and upwards.

## Ferranti Clock Prices Reduced

LATEST announcement by Ferranti Ltd. shows considerable reductions in the prices of the electric timepieces produced by the company.

Typical reductions are Model 33 in light oak, mahogany or walnut which is reduced from 67s. 6d. and 72s. 6d. to 47s. 6d. Model 320 in dark oak with 6 in. silvered zone is reduced from 112s. 6d. to 90s.

## Heavy Duty Cleaner by "Hoover"

RECENTLY introduced by Hoover Ltd., of Perivale, Greenford, Middx—we mentioned this in our review of the Hotel Exhibition, January 26 issue—the Hoover heavy-duty cleaner Model 912 embodies many new features. Like all "Hoovers," it beats as it sweeps as it cleans, but this model now applies the principle to large-scale cleaning, yet is still light enough for women cleaning staff to handle.

Specially strengthened features include seamless steel handles, extra reinforced dust bag steel strengthened, aluminium main casting, extra heavy 12-bladed aluminium fan, steel fan chamber liner and heavy moulded guards on main casting. Price is £23 plus Purchase Tax £5 15s.

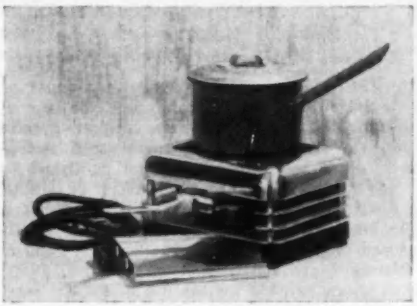
**The Hoover heavy duty model 912**

## Flat Dwellers Master Cooking Problems

PARTICULARLY suited for use in small flats is the "Mastercook," now being made by Warnford Constructions Ltd., 1 Chesterfield Street, London W.1.

Neatly styled, the "Mastercook" is an electric griller toaster, boiler and fryer all in one, yet takes up hardly more room than the flat dweller's gas ring which it is designed to replace. Dimensions are 9 in. wide, 8 in. deep and 4 in. high; weight (complete with grill pan and toaster shelf) is only 5½lb. and the loading is 750 W. It is made throughout in ⅛ in. plate aluminium and is mounted on hardwood feet to avoid scratching the polish on your table. The element is mounted under a cast-iron hotplate in such a position that it can be used as a griller at the same time as a boiling plate. By moving the toast tray, the heat is reflected upwards, thus decreasing boiling time. Supplied with a heat-resisting glass grill pan which doubles as a frying pan, the "Mastercook" affords full cooking facilities for two persons at the low price of 59s. 6d.

**Below : The Warnford "Mastercook"**



## Pig Farrowing Heater

DESIGNED especially for use in piggeries to help prevent the high mortality rate among young piglets during the winter months is a new heater now added to the range of products of the General Electric Company, Ltd., Magnet House, Kingsway, London W.C.2.

The heater consists of a chromium plated reflector fitted with a 1 kW rod type element and a wire mesh guard. A robust steel bracket is supplied and enables the heater to be mounted on a horizontal or vertical surface. Heating elements are available for main supplies between 200 V and 250 V and the heater is fitted with three yards of 3-core TRS cable.

## Re-styled Hotpoint Clothes Dryer

IN a note published in our issue of February 9 we stated that purchase tax on the new dryer was £1 9s.; this should have read £1 19s.

## Switchgear Prices Drop

PRICES of the well known HH unit type metal clad distribution gear manufactured by A. Reyrolle and Co. Ltd. of Hebburn-on-Tyne, have been considerably reduced. These changes are coupled with greatly improved delivery. Main factor in these alterations is said to be improved manufacturing technique in the company's works. Pamphlet 824 describes this range of switchgear.

## A New "Nettle" Accessory

CURRENT introduction by Victor H. Iddon Ltd. of Harper Road, Wythenshawe, Manchester, is a new surface type ring main

**The new "Nettle" 13 Amp ring main socket**

socket. Main feature is the porcelain interior which reduces the possibility of tracking. Also incorporated is a new type contact and terminal which will take up to three 7/0·029 cables. The socket is complete with knockouts for surface wiring and is suitable for use with all flat pin plugs to B.S. 1363. List price of the socket is 3s. 6d. Included in the illustration above is a "Nettle" 13-amp fused plug top to B.S. 1363.

## TRADE PUBLICATIONS

MANUAL OF CONTROL OF LOW TENSION ELECTRIC CIRCUITS, by "Kilovar." Published by A. P. Lundberg and Sons, Ltd., Credenda Works, Rood End Road, Oldbury, nr. Birmingham. 8th edition, 134 pages, 6½ in. x 4¼ in. Price 3s. 6d.

LAMPS AND LIGHTING. Latest price lists and catalogues are now to hand from B.T.H., illustrating "Mazda" lamps, from Omega Lampworks, Ltd., from Simplex Electric, List L1791, for all lighting fittings excluding flameproof fittings; and from Ecko-Ensign, Ltd., listing fluorescent lighting.

INSULATORS. Pin type insulators for overhead transmission lines are illustrated in Catalogue No. 34, an attractive new issue by Steatite and Porcelain Products, Ltd.

COMPONENTS. New leaflet issued by A. F. Bulgin and Co., Ltd., shows their up-to-date lines.

INSTRUMENTS. "Technique," journal of instrument engineering, produced by Muirhead and Co., Ltd., contains interesting articles on constant-impedance alternators and faders, miniature standard cells and phototelegraphy with its application in medicine.

# THE WEEK IN NEWS

### New Fan Section of B.E.A.M.A.

THE Council of the British Electrical and Allied Manufacturers' Association has approved the formation of a Ceiling and Table Fan section. The members of this section are: Berkeley and Young Ltd.; Crompton Parkinson Ltd.; H. Frost and Co. Ltd.; General Electric Co. Ltd.; Limit Engineering Co. Ltd.; Revo Electric Co. Ltd.; and Veritys Ltd. Secretary of the section is Mr. W. C. Ludlow, at 36 Kingsway, London, W.C.2.

### Argentine Orders Marconi Transmitters

AS we briefly recorded last week, the Argentine Government, who are planning to have the most powerful broadcasting system in South America, have placed an order with Marconi's Wireless Telegraph Co. Ltd., for two 100 kW medium-wave, air-cooled transmitters. The contract was obtained in face of keen American and Dutch competition; and a Marconi technical expert was specially flown to Buenos Aires last summer to take part in the negotiations.

Of the latest air-cooled type both the transmitters are to be installed at Gral Pacheco, about 15 miles from Buenos Aires. Arrangements are being made so that they can be worked in parallel to give a total output of 200 kW when required.

### B.E.A. Honour Supply Veterans

GRACEFUL tributes to the work of three leading members of the electricity supply industry are paid by the names which B.E.A. have chosen for additions to their collier fleet. Of three 4,600-ton colliers which are being built by Messrs. William Pickersgill and Sons Ltd., for trading to power stations on the Lower Thames, one is to be named after the late Sir Archibald Page, and the other two will bear the names respectively of Captain J. M. Donaldson and Mr. W. J. H. Wood.

Sir Archibald, who died in March last year, was chairman of the Central Board from 1935 until his retirement, owing to ill-health, in June, 1944.

Captain J. M. Donaldson, a member of Eastern Board, has carried out much pioneer work in electricity supply, particularly in the use of steam at increased pressures and temperatures in generating plant.

Mr. W. J. H. Wood is a member of London Board. Formerly engineer-in-chief of the County of London Electric Supply Co. and its associated companies, he was appointed director of the parent company in 1943.

### Discussions on Automatic Control

ALTHOUGH recent years have seen great strides in the development of automatic control mechanisms, there is no organisation entirely devoted to encouraging progress in the subject. An attempt is now to be made by the Society of Instrument Technology to form a control section for the discussion of the interesting aspects that are involved.

The section will cover the theory and practice of closed loop control systems, including servo mechanisms, regulators and process controllers. The inaugural meeting will be held on Tuesday, March 28, at 6.30 for 7 p.m., at the Royal Society of Tropical Medicine and Hygiene, Mansion House, Portland Place, W.1, when three short papers will be read.

### Export Experts Explain

FIVE distinguished lecturers are to participate in an important new series of twenty lunch-time lectures on various aspects of export trade. Arranged by the Institute of Export, the lectures will be given at Conway Hall, Red Lion Square, W.C.2, every Tuesday at 1 p.m., beginning on March 7. Full details from A. J. Townsend, Institute of Export, Holland House, 140 Cromwell Road, S.W.7.

### Control of Siliceous Parting Powders

AFTER four years of exhaustive discussions, draft regulations prohibiting the use in foundries of parting powders containing more than 3% of compounds of silicon calculated as silica, have been amended. First published towards the end of 1945 by the Minister of Labour, industrial technical experts raised a number of objections to the proposed measures. In the revised regulations, entitled "The Foundries (Parting Materials) Special Regulations, 1950," exemptions provide for the use of natural sands and certain substances (e.g. sillimanite) containing substantial percentages of compounds of silicon other than "free silica." Any further objections must be made before April 15 to the Secretary, M.o.L., 8 St. James's Square, S.W.1.

### *The First Half Century*

At the G.E.C. dinner, Mr. Hugo Hirst spoke of the conservatism of English law in the matter of ancient rights-of-way and of ancient lights; things which no one really wanted to insist on, and which were made use of to hamper and to extort money from any new enterprise. A plea for more mixture of classes in education, as likely to be of mutual benefit to all to supply us with "the sergeant and corporal of civil life" and to lead to a better understanding between masters and men, was a most important suggestion in the speech, though the difficulties of carrying it out would be enormous.—*From our issue of February* 22, 1900.

## Atomic Energy Development

THE larger atomic energy pile at Harwell—BEPO—started operating on July 3, 1948. After initial tests, production of radio-isotopes began in February, 1949. Experience with BEPO has now led to the development of a new form of uranium cartridge which is capable of standing up to much higher temperatures than those previously used. This will enable the energy available in the pile to be increased considerably. At present the pile is being used for production of radio-active samples, and for investigation into the effects of neutron and gamma radiation on the physical properties of materials. It has been also found that certain chemical reactions hitherto known only to occur at extremely high temperatures, can be induced by irradiation at normal temperatures, and investigations are continuing into the mechanism whereby this occurs.

A magnificent model of the "Gleep" (graphite low-energy experimental pile), Britain's first pile, was on Thursday put on show at the Science Museum, South Kensington. Close by are Aston's original mass-spectrograph with which individual atoms were first accurately weighed in 1919, and part of Cockcroft and Walton's original apparatus used in 1932 for artificial atom-smashing by purely electrical means.

## Giant Plant for Atom Research

PROGRESS on the new giant atom-splitting machine, a 156-in. diameter synchro-cyclotron, for Liverpool University's physics department, is well in hand (see photo). Although it will not be operating for another two years, installation of the 1,600-ton high-grade steel electromagnet has already begun. Work is being carried out by the English Steel Corporation working in conjunction with Metropolitan-Vickers Electrical Co. Ltd. A high-tension generator capable of accelerating particles up to 1,250,000 V will be housed in a special high-voltage room.

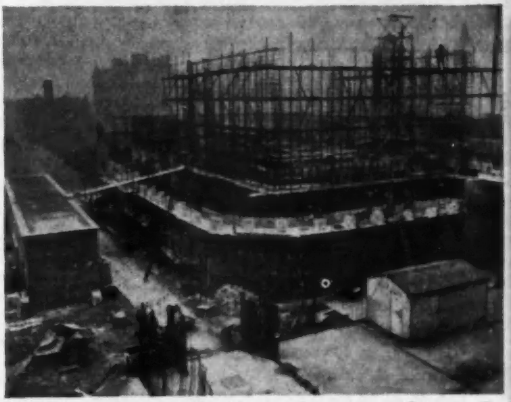
## Revised N.J.B. Agreement

THE final draft of the revised National Joint Board Agreement for the electricity supply industry was approved at the meeting of the N.J.B. on Friday last, it is now officially stated. We reported on December 15 last that the new agreement was nearing completion after some months of discussions. The revised agreement covers the salaries and conditions of employment of the technical engineering staff of the Electricity Boards. Its scope has been extended to include not only the power station and distribution staff but also those of the Central Authority Headquarters, Area Boards and Divisional Headquarters, many of whom were previously embraced within the organisation of the C.E.B. The revised agreement operates with effect from July 1, 1949, in view of the prolonged negotiations.

## "Supply Industry Needs Administrators"

"ONE of the greatest needs of the electricity supply industry at the present time is for skilled managers and administrators," Mr. S. F. Steward, chairman, S. Western Board, said at the annual dinner of Western Centre, I.E.E., at Grand Spa Hotel, Clifton, on Friday. Speaking as a former industrialist, Mr. Steward said that an outstanding fact about electricity supply was the high ratio of capital to revenue.

At the present time the industry depended on its engineers, not so much for their technical excellence which had come to be taken for granted, but for their ability to stretch available capital to the utmost limit to ensure that the maximum return and benefit was obtained from every pound spent.



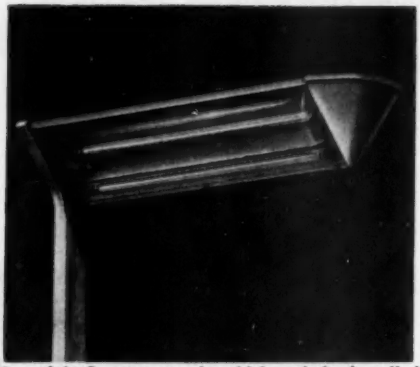
**Work in progress on the Liverpool synchro-cyclotron. On left is the high-tension power house**

Among those present were: Professor E. B. Moullin, president, I.E.E.; Mr. H. Midgley, deputy chairman, South Western Board; and Mr. L. Burdes, chairman, Western centre.

## Victoria to Build 5,000 Pre-fabs

A NEW Government scheme to speed up housing in Victoria, Australia, provides for reclamation and rebuilding of slum areas by the Housing Commission and the import of 5,000 prefabricated houses from overseas. Announcing the scheme, the Premier, Mr. Hollway, said that five separate overseas contractors would be sought to supply 1,000 pre-fabs each and to provide construction gangs to erect the homes on selected sites. The pre-fabs are to be built to Australian standards and specifications, and fitted with electrical appliances and services to standards set by the State Electricity Commission of Victoria.

Already 500 British and European firms have registered for tenders. Mr. J. H. Davey, secretary of the Housing Commission, said on Friday that in view of the exceptional interest, the closing date for tenders had been extended to April 17. Contractors would have to bring 90% of the labour force required for the erection of the houses. The whole scheme is expected to cost £1,600,000 sterling.



One of the fluorescent units which are being installed in Lisburn, N. Ireland

### Street Fluorescents for N. Ireland

BELIEVED to be the largest fluorescent street lighting scheme yet undertaken in the British Isles, 170 3-80-watt lanterns, together with nearly 400 Class "B" lighting lanterns and standards, are being installed in Lisburn, Co. Antrim, by Siemens Electric Lamps and Supplies Ltd. First completed street was recently switched on in the presence of engineers of the Electricity Board for N. Ireland and members of the U.D.C. The fluorescent lanterns are mounted on a Concrete Utilities 3DN shaft, incorporating a special head designed by the two companies.

### Training Overseas Students

IN furtherance of the aim of the Council of B.E.A.M.A. to increase the facilities available for the works training of post-graduate students from overseas, a conference of Association members is to be held in April. At this, details of the scheme will be explained, and steps taken to put it into action. It is proposed that a student from overseas should spend periods of approximately six months with firms specialising in different branches of the industry, so that at the end of two years he will have had a comprehensive practical training, from which should spring a healthy friendship with Britain.

### New Home for Radio Exhibition

THE national radio exhibition coinciding with the Festival of Britain next year will be held at Earls Court, London. So will the national exhibitions in 1952 and 1953. In announcing this on Friday the Radio Industry Council said that an earlier decision to hold the exhibition at Olympia, London, in June instead of autumn had been changed, but the change came too late to secure convenient autumn dates and the necessary space at Olympia. In view of the facilities offered at Earls Court it was decided to go there rather than hold the exhibition at Olympia at a less convenient time.

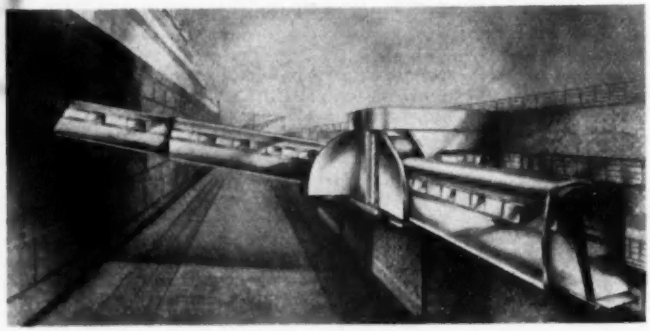
### Radio Sales Still High

PEOPLE who installed a new radio set "specially for Christmas" helped to influence December's R.T.R.A. sales index, which shows a further increase for both radio and television. Average number of radios sold per shop was 17·71 compared with 16·11 sold during December, 1948. Television sales at 13·18 showed an increase of 1·29 over the previous month and were almost double the comparative month's sales last year. An interesting point about T.V. sales is that 76% were for cash.

### Preventing Ships' Fires in Port

WELDING and cutting apparatus caused 42% of all outbreaks of fire in ships in port during the three years ending 1948, reveals the working party report on "Fire Prevention and Fire Fighting in Ships in Port," published on Friday. In comparison 6% of the fires were of electrical origin, and of these 58% were a result of short circuits. Fires are more likely to arise where cables have been previously overloaded and insulation has deteriorated, and where repair to electrical circuits is carried out by men unfamiliar with the wiring arrangements.

The working party recommends that use of temporary wiring should be restricted to that necessary for repair work, and that cables should be adequately protected against chafing through doorways or over sharp projections. All circuits should be correctly fused to prevent overloading, and except for emergency lighting, ships undergoing repair should be "dead" electrically.



Artist's impression of an electrically operated twin turret passenger gangway for the new British Railways passenger terminal at Ocean Dock, Southampton. Altogether three units, each consisting of a travelling shore housing and two totally enclosed telescopic gangways, have been designed and constructed in aluminium alloy by Structural and Mechanical Development Engineers Ltd.

### Aiding Britain's Recovery

AMONG the largest world exporters of electric fires and cookers, Belling and Co. Ltd., have increased their overseas sales by 500% in three years. Our photograph shows a fleet of lorries stacked with electric cookers, leaving the Enfield works for export to Australia and the Far East. At the present moment advance publicity is being conducted in U.S.A. and Canada for several special appliances, including an attractive and realistic electric "log fire."

**Belling cookers for export to the Far East leaving Enfield**

### A Social, a Party and a Panto

MEMBERS of the executive staff and employees of Frederick Smith and Co. filled Broughton Assembly Rooms to capacity for the annual social evening. Modern and old time dancing, a cabaret of tap dancers, singers and other entertainers, together with competitions for all, made the evening most enjoyable. On Friday, 400 members of the company and their friends attended a pantomime, *Babes in the Wood*, at the Palace Theatre, Manchester. When an associated company, Liverpool Cables, recently held their annual party for employees' children, about 230 children soon cleared the well-laden tables in St. John's Hall, Bootle.

### Improving Belisha Crossings

SEVERAL London pedestrian crossings are being used for experiments to see whether lighting can lead to improved behaviour on the part of both pedestrians and motorists. The experiments consist of floodlighting the surface of crossings marked with the black and white "zebra" stripes at some sites, and internally lighting the orange globes of the Belisha lamps with 60-watt lamps at others. A window of clear glass in the globe is designed to throw some of the light down on to the crossings. Preliminary results show the experiments are successful.

### Teamwork Results in Success

"THE success of any company is a reflection of the ability of the individuals to work together as a team," Mr. Arthur Parkinson, director of Crompton Parkinson, said at the annual staff dinner of Abell and Smith's Electrical Co. Ltd., at the Guildhall, Worcester, on Thursday. Mr. H. F. Wilkins, director and secretary, commented that many employees were shareholders in the company, a state of affairs which seemed to be one of the ideals being expressed from platforms throughout the country. Long service certificates for 25 years' service were presented by Mr. H. Horton Smith, managing director, to Mr. R. Morris and Mr. L. J. King.

## NEWS IN BRIEF

Third annual dinner and reunion of ex-Johnson and Philips Association will be held at Grosvenor House on March 4. Tickets, price one guinea, from Mr. H. D. Parsons, "Heigham," 20 Beaumont Road, Orpington, Kent.

Ministry of Works display, "Prestressed Concrete," has moved to London Building Centre in Conduit Street, W.1.

Power cuts between September 1 and December 15, 1949, cost N. East industry £33,343 in manual workers' wages, report Tyne Shipbuilders' Association and N.E. Coast Engineering Employers' Association.

Visitors to Rand agricultural show in Johannesburg from April 1-10 will see "live" television for the first time in demonstrations to be given by Marconi's Wireless Telegraph Co. Ltd., and Cinema Television Ltd.

Destroyed by enemy action during the war, the most northerly broadcasting station in the world, at Vadso, Norway, has been re-equipped with a 20 kW transmitter by Standard Telephones and Cables Ltd.

Their first production since the war, "21 Theatre Group," the dramatic section of B.I.C.C. athletic and social club, presented Noel Coward's *This Happy Breed* to a packed house at Cripplegate Institute Theatre, E.C.1.

A handsomely bound volume entitled "Fifty Years of Progress, 1900-1950," just issued by Aiton and Co. Ltd., recalls some of the interesting facts leading to the founding of the firm by Sir J. Arthur Aiton (who died last month).

Two new halls will add an extra 10,000 sq ft of cover to this year's Lyons International Fair from April 15-24. Particulars obtainable from Robert Brandon and Partners Ltd., 45 Dover Street, W.1.

Laboratories for investigation of processes used in the extraction and manufacture of non-ferrous metals and alloys have been opened by British Non-Ferrous Metals Research Association in Euston Street, N.W.1.

# ELECTRIC SUPPLY NEWS

***Barnes***

The council is seeking permission from the Ministry of Health to help tenants to pay for new radio sets, electric clocks, cookers and other electrical appliances when they transfer from houses with d.c. current into new council houses with an a.c. supply.

***Douglas***

The Electricity Committee has under consideration matters arising as a result of the Isle of Man Electricity Board obtaining powers to erect a generating station to supply their area with electrical energy, and the borough electrical engineer, Mr. C. Anderson, has been instructed to obtain further information on certain lines indicated by the committee.

***Newcastle-upon-Tyne***

It was intended to improve the amenities of older houses by installing electric lighting at the end of the war, but the Ministry of Health advised postponement of the plan in view of the need to conserve materials and labour. The Housing Committee now feels, however, that the work will not interfere with housing progress, and recommends that electricity be substituted for gas lighting in a total of 4,650 flats at an estimated cost of £115,924. The work would be spread over five years.

***North of Scotland***

On Thursday last, the new Aultbea (Western Ross) diesel generating station of the North of Scotland Hydro-Electric Board, was formally set into operation, supplying 70 homes in Gairloch, 10 miles away. This diesel station will serve the area until the opening of the new 600 kW hydro-electric station which is now under construction. Gairloch parish is a sparsely populated area, and altogether 83 miles of o.h. distribution lines will be needed to supply a total of 500 consumers. It is expected that the entire area will be served in just over 12 months.

Winning the race with the Loch Sloy scheme for completion of the initial stage, the first generator at the Clunie power station, on the Tummel Garry hydro-electric scheme, was tested last week.

***North Wales***

An indication of the plans of the British Electricity Authority regarding the £20,000,000 hydro-electric developments plan in North Wales was given at a meeting of the River Conway Fishery Board last week. Members of the board received a letter from the Ministry of Agriculture and Fisheries stating that the B.E.A. was preparing a private Bill to be deposited in the autumn and which it was hoped would become law in the summer of next year.

The Bill would attempt to obtain authority for all the schemes which had already been made public. Anticipating the opposition which is expected the B.E.A. seeks to meet as many interested bodies as possible, to arrive at the safeguards to be included in the Bill.

## LIGHTING SCHEMES

**Alnwick.**—The U.D.C. intends to change over street lighting from gas to electricity.

**Gt. Yarmouth.**—The Finance and Law Committee has referred back to the Highways and Public Lighting Committee a scheme for improving the lighting of the North Drive between the Royal Aquarium and Barnard Avenue. The cost is estimated at £3,500.

**Pewsey.**—The Southern Electricity Board has been instructed to proceed with the work of installing street lighting at Fittleton, Burbage, Collingbourne Ducis and Netheravon, and the conversion to fluorescent lighting at Pewsey and Ludgershall.

**Portstewart.**—A plan for street lighting, submitted by the Northern Ireland Electricity Board, was considered at the recent meeting of the Urban Council. The estimated cost was £4,060. The Council decided to ask the Board to set out the separate costs of labour and material.

## POWER STATION EXTENSIONS

As part of the British Electricity Authority's programme up to and including the year 1952, proposed extensions to eight power stations have been officially approved during the past three months by the Minister of Fuel and Power. The extensions provide for an aggregate installed capacity of 621,500 kW.

Details are as follows:—

| Station (Division in brackets) | Generating Plant No. and Capacity (MW) | Boilers No. and Capacity (klb/hr) |
|---|---|---|
| Drimsdown (Eastern) ... .. | 1 x 60 | 2 x 360 |
| Carmarthen Bay (S. Wales) ... | 2 x 60 | 4 x 240 |
| Chadderton (N. Western) .. | 1 x 60 | 2 x 360 |
| Clarence Dock (Merseyside and N. Wales) ... ... ... | 1 x 51·5 | 2 x 350 |
| Littlebrook "C" (S. Eastern) ... | 1 x 60 | 2 x 360 |
| Staythorpe (E. Midlands) .... | 1 x 60 | 2 x 240 |
| Tilbury (Eastern) ... .... | 3 x 60 | 3 x 540 |
| Woolwich (London) ... . | 1 x 30 | 2 x 180 |

Carmarthen Bay, Chadderton, Littlebrook "C", Tilbury and Staythorpe, are, of course, new stations which have not yet been placed in commission, although the last named is expected to commence generating within the next few weeks.

Although these projects were included in the Central Authority's programme published in the first annual report, they have now received formal consent. One modification, however, is in regard to the Carmarthen Bay station, where the original proposal has been slightly amended to allow for the installation of two larger sets.

# COMPANY ACTIVITIES

***Cable & Wireless (Holdings)***

The amended scheme for dealing with the compensation received following acquisition by the Government, has been submitted to stockholders. The directors are still convinced that liquidation is not in the best interests of the stockholders. In addition to the previous offer, Preference stockholders are now given two further choices: (*a*) to convert their holdings, in whole or part, into Ordinary stock at par; or (*b*) receive, in whole or part, 4% ten-year unsecured loan stock. Under the new proposals, Ordinary stockholders for each £100 stock may get £125 3% Savings Bonds, 1965-75, plus £180 Ordinary stock (resulting from a bonus distribution of £80 Ordinary stock). They also have the right to take in lieu of the whole or part of the £180 Ordinary stock 3½-year Unsecured loan stock, on terms to be determined.

***Crystalate Ltd.***

A net loss, before taxation, of £7,166, as compared with a net profit of £41,788 for the previous year, is shown in the preliminary statement. There is a dividend on the 8% Cumulative Preference stock, but no Ordinary dividend is recommended.

***East India Tramways Co.***

The directors state that the agreement for the sale of the undertaking for Rs. 27 lakhs has been implemented and the purchasers are in possession, but registration of the transfer cannot be effected until a certificate is obtained that taxation liabilities have been discharged, or provision made for payment.

***English Electric Co.***

The preliminary statement shows a profit of £638,571 after providing £860,000 for taxation and £493,853 for depreciation, as against a profit of £535,027 for 1948, after crediting non-recurring revenue of £55,513 and providing £505,000 for taxation and £395,289 for depreciation. There is a final Ordinary dividend of 6%, making 10% (*same*). Consolidated profit applicable to the group was £709,194 (*£595,968*). It is announced that stockholders of the company subscribed for 96½% of the recent "rights" issue of 589,789 £1 Ordinary shares at 35s. each in the proportion of one for six held.

***India Rubber, Gutta Percha and Telegraph Works Co.***

Consolidated profit for the year to September 30 was £142,759 (*£291,613*), plus other income £2,845 (*£2,696*) making £145,604 (*£294,309*). To depreciation of fixed assets £31,293 (*£26,939*), off moulds, etc., £22,937 (*£20,902*), excess current prices provision nil (*£989*), mortgage interest nil (*£2,303*), audit fee £865 (*£863*), director's emoluments £4,249 (*£4,305*), income tax £13,252 (*£80,431*), profits tax £10,300 (*£26,760*), leaving a group net profit of £62,708 (*£130,817*), plus net interest on settlement of war damage claim £7,423 (*nil*), special credit in respect of prior periods nil (*£60,901*), making £70,131 (*£191,718*). Deduct exchange loss on Argentine current assets consequent upon devaluation of the peso £18,488 (*nil*), deferred repairs £2,000 (*£61,375*), deferred premiums under group pension and life assurance scheme nil (*£59,056*), premium on repayment mortgage nil (*£1,876*), forward in books of subsidiaries £3,960 (*£5,712*), leaving the parent company £45,683 (*£63,699*). To contingencies reserve £25,000 (*£26,984*). Preference dividend £7,563, preference ordinary dividend 8% £6,600 (*both same*), ordinary dividend 9% £4,950 (*same*), leaving £126,356 (*£124,786*) carried forward.

***International Combustion (Holdings) Ltd.***

The preliminary statement shows a net profit, before taxation, of £570,044 (*£454,419*). The directors recommend a final dividend of 11% on the £879,245 Ordinary capital as increased by the 150% bonus issue in August last. Total distribution for the year is therefore 21%, as against a total of 37½% on the old capital. Taxation provision absorbs £341,738 (*£273,282*). The amount brought forward from the previous year, £95,486, was reduced during the year by £27,547, which, together with a sum of £500,000 transferred from the general revenue reserve, has been utilised in payment for the bonus issue of Ordinary shares. The sum of £100,000 has now been transferred to general revenue reserve, and there is £118,758 carried forward.

***Manx Electric Railway Co.***

Operating profit for the year ended September 30 last was £14,006 (*£22,402*). Debenture interest takes £7,840, and with taxation provision not required £6,080 and £12,842 brought in, there is £25,088 available. To general reserve £10,000, first mortgage debenture stock sinking fund £2,000, dividend of 2% on Ordinary shares as reconstructed £2,804, leaving £10,284 carried forward.

***Dividends Declared***

*Oriental Telephone and Electric Co.*—Interim dividend of 4% (*same*).

*Geo. Cohen, Sons and Co.*—Interim dividend of 8% (*same*) payable on March 31.

*Marconi's Wireless Telegraph Co.*—Ordinary dividend for the 53 weeks ended December 31, 1949, of 7%, payable on March 23. Profit is £140,483 (*£132,726*), after providing for taxation and depreciation.

*Marconi International Marine Co.*—Final dividend of 5%, making 7½%, payable on March 23. Profit is £60,000 (*£58,327*), after providing £217,969 (*£173,556*) for depreciation, and £45,000 (*£55,000*) for taxation.

*Richard Johnson, Clapham and Morris.*—Interim dividend of 5%.

*Taylor Tunnicliff (Electrical Industries).*—Ordinary dividend of 15% (*same*). Net profit £123,428 (*£85,125*).

# Commercial Information

## CONTRACTS OPEN

*The date stated is the last day for receiving tenders. Details of items marked • may be obtained on application to Room 1076, Board of Trade, Thames House North, Millbank, London S.W.1, quoting reference number.*

**February 24.—Arbroath.**—Electrical work for 30 houses at Cliffburn Road. W. R. Samson, Housing Architect, Olympia Buildings, Market Place, Arbroath.

**February 24.—Burnley T.C.**—Electrical installations for extensions to Towneley technical high school. Borough Engineer, Town Hall, Burnley. Deposit £1 1s. Advertised in February 9 issue.

**February 24.—Horwich U.D.C.**—Twelve months' supply of electric lamps. J. Seddon, Clerk of the Council, Council Offices, Horwich, Lancs.

**February 25.—Bath Hospital Management Committee.**—Conversion of electric lighting, heating and power installations from d.c. to a.c. at Winsley Sanatorium, Limpley Stoke, near Bath. J. Lawrence Mears, secretary, Bath Hospital Management Committee, Manor Hospital, Combe Park, Bath. Deposit £3 3s.

**February 25.—Carluke.**—Installation of control switchgear and laying of underground mains in Roadmeetings Infectious Diseases Hospital. H. K. Mitchell, secretary, Law Hospital, Carluke.

**February 25.—Evesham T.C.**—Supply and erection of 34 high pressure sodium electric discharge street lighting lamps on Bath-Evesham-Lincoln trunk road. N. F. Davies, Town Clerk, 3 Leicester Gables, High Street, Evesham. Advertised in Jan. 19 issue.

**February 25.—Meath C.C.**—Automatic emergency lighting system for use with existing theatre lighting unit at Our Lady's Hospital, An Uaimh. County Engineer's office, County Hall, Navan.

**February 25.—Musselburgh T.C.**—Installation of electric lighting in 134 houses. Burgh surveyor, Municipal Offices, Musselburgh.

**February 25.—Tynemouth T.C.**—Year's supply of electric lamps, lamp columns and cable. Borough Surveyor, 19-20 Howard Street, North Shields.

**February 27.—Aberdeen C.C.**—Installation of eight electric street lanterns and four "Keep Left" bollards in Mintlaw village. M. Heddle, county road surveyor and engineer, 25 Union Terrace, Aberdeen.

**February 27.—Barking T.C.**—Twelve months' supply of vehicle accumulators. Borough engineer and surveyor, Town Hall, Barking.

**February 27.—Cuckfield R.D.C.**—Installation of electricity in houses at (1) Keymer; (2) Hassocks; (3) Hurstpierpoint; (4) Anstye; (5) Warninglid; (6) Slough Green; (7) Balcombe; (8) Ardingley; (9) Poynings; (10) Twineham; (11) Bolney; (12) Sayers Common; (13) Handcross; (14) Pycombe Street; (15) Horsted Keynes; (16) Albourne; (17) West Hoathly; (18) Crawley Down; (19) Copthorne; (20) Pound Hill; (21) Three Bridges. Engineer and Surveyor, A. Hutchings, Rural Council Offices, Boltro Road, Haywards Heath. Deposit 10s. 6d.

**February 27.—Lochgelly T.C.**—Electrical work for 32 houses to be erected at Cooper Ha' Park housing scheme. Architect, Alexander Watson, 24 Queen Anne Street, Dunfermline.

**February 27.—Runcorn U.D.C.**—Twelve months' supply of electric lamps. Engineer and Surveyor, Town Hall, Runcorn.

**February 27.—Uruguay.**—One electro pump, 1 diesel generating set and 1 control and distribution board. Administracion Nacional de Combustibles Alchohol y Portland. B.o.T. (Ref. CRE (IB) 42215/50).•

**February 27.—Wick T.C.**—Electrical work for 28 houses on East Bank site. James Macaulay and Son, surveyors, 37 St. Vincent Crescent, Glasgow C.3.

**February 28.—Armagh.**—Internal P.B.X. telephone and fire alarm system in St. Luke's Hospital. Secretary, Management Committee.

**February 28.—Australia.**—Supply of armoured control cable (Schedule No. 270). Secretary, Tender and Contract Committee, Department of Civil Aviation, 522 Little Collins Street, Melbourne, or Superintendent of Stores at Brisbane, Sydney, Adelaide or Perth.

**February 28.—Australia.**—Two 2,500 kVA through-put auto-transformers, 11/6·6 kV, 3-phase, 50 cycles; four 2,500 kVA through-put auto-transformers, 22/11 kV, 3-phase, 50 cycles. Agent-General for New South Wales, Engineers Branch, 56 Strand, W.C.2.

**February 28.—S. Rhodesia.**—Two 1,250 b.h.p. synchronous induction motors, r.p.m. at 50 c/s. 1,000 (alt. 1,500) for main pumping station, and two 850 b.h.p. synchronous induction motors, r.p.m. at 50 c/s, 1,000 (alt. 1,500) for booster station at Hunyani Poort pumping station. Town Clerk, Municipal Offices, Kingsway, Salisbury, S. Rhodesia. B.o.T. (CRE (IB) 37695/49).•

**March 1.—Australia.**—Tenders for 10, 20, 30 or 40 electric locomotives of 108 tons, 2,700 h.p., 1,500 V d.c. Specification No. 2, 190 for mechanical parts and installation; Specification No. 2, 189 for traction motors, control equipment, air compressors and pantographs. Chief Mechanical Engineer, New South Wales Government Railways, Room 202, 19 York Street, Sydney.

**March 1.—Coulsdon and Purley U.D.C.**—Seventy-three single tube and four twin tube fluorescent lighting fittings, Met-Vick type 292034, for council offices. E. F. J. Felix, Clerk of the Council, Council Offices, Purley. Advertised in February 19 issue.

**March 2.—Australia.**—Cooling radiators for power transformers. Specification No. 1353. Deposit £210. 11,000 V, 250 MVA, metal-clad switchgear for Chatswood substation. Specification No. 1346, Deposit £110. Comptroller of Stores, Old Electricity Building, St. Andrews Place.

**March 2.—Cleethorpes T.C.**—Complete wiring installation in 56 houses on Love Lane Corner and Highgate sites. Allan Cooper, borough engineer and surveyor, Council House, Cleethorpes.

**March 2.—Uruguay.**—Three groups of control gears for 3-phase, 2,100 kVA, 6,300 V diesel electric generators. Usinas Electricas y Telefonos del Estado. B.o.T. (Ref. CRE (IB) 42252/50).*

**March 3.—New Zealand.**—One hundred milliameters, 3 in., square pattern, for flush panel mounting, moving coil type, 0-5 milliamps full scale deflection. Instruments to be calibrated for use on non-ferrous panels and must be in accordance with BSS No. 89 for instruments of first grade accuracy. Director-General (Stores Division), General Post Office, Wellington, C.1.

**March 4.—Hepton R.D.C.**—Pumping plant for Heptonstall water extension. Two sets of pumps, electric motors with automatic control starting gear, etc. Council's Consulting Engineer, A. Brooksbank, 14 The Exchange, Bradford.

**March 4.—Irlam U.D.C.**—Twelve months supply of electric lamps. Engineer and Surveyor, Council Offices, Irlam, near Manchester.

**March 6.—S. Africa.**—Eight three-phase, four wire, metal-clad, low tension air break switchboards. Electrical Engineer, Town Council of Boksbury, near Johannesburg.

**March 6.—Uruguay.**—Micro-telephones and induction coils. Direccion General de Comunicaciones, Montevideo. B.o.T. (Ref. CRE (IB) 43735/50).*

**March 7.—Argentina.**—Provision and installation of h.t. cables between San Nicholas and Zarate, comprising approximately 143 km of 66 kW line and accessories. Directorate of Electricity and Mechanics of Ministry of Public Works, Buenos Aires. B.o.T. (CRE (IB) 30675/50).*

**March 8.—Mendip Hospital Management Committee.**—Twelve months' supply of electrical accessories. M. L. Lowe, secretary, Mendip Hospital Management Committee, Wells, Somerset.

**March 9.—Port of Bristol Authority.**—Twelve months' supply of electric lamps and sundries. Central Purchasing Dept., 2 Upper York Street, St. Paul's, Bristol 2.

**March 9.—Greece.**—Telephone apparatus, including cables and terminal boxes. Greek State Railways, Athens. B.o.T. (Ref. CRE (IB) 43578/50.)*

**March 10.—British East Africa.**—Installation of an automatic internal telephone system in Nairobi Town Hall and proposed City Hall. Municipal Council of Nairobi. B.o.T. (Ref. CRE (IB) 41239/50).*

**March 10.—Manchester T.C.**—Electrical installation at Old Hall Drive secondary school, Gorton. City architect, Town Hall. Deposit £1 1s.

**March 11.—Keighley T.C.**—Small electrically driven "booster" pumping plant for waterworks department. G. E. V. Boldry, waterworks engineer, Martins Bank Chambers, Keighley.

**March 13.—Argentina.**—Electrical pumping equipment, low tension switchboards and venturi meters for the administration at Junin, Buenos Aires. B.o.T. (Ref. CRE (IB) 42990/50).*

**March 13.—Slough T.C.**—(*a*) Provision and erection of 42 pre-cast concrete columns and 42 mercury vapour lanterns for Stoke Poges Lane (East) estate. (*b*) One motor tower waggon for street lighting maintenance. Borough engineer, Town Hall, Slough. Advertised in this issue.

**March 14.—East Lothian Water Board.**—Electrically driven surface pumps. Two pumps at 500,000 gal per day each and two at 1,500,000 gal per day each, for Whiteadder Valley pumping station, near Priestlaw. G. H. Hill and Sons, Civil Engineers, 51 Mosley Street, Manchester.

**March 15.—Southern Rhodesia.**—Supply and installation of a public address and radio diffusion system. Town electrical engineer, P.O. Box 121, Umtali, Southern Rhodesia.

**March 15.—India.**—Year's supply of various types of cables; estimated value Rs 1,700,000. Director general of Industries and Supplies, New Delhi. B.o.T. (Ref. CRE (IB) 43576/50).*

**March 15.—Stepney T.C.**—Installation of three electrically operated passenger lifts in flats being erected at Bancroft Road. Borough engineer and surveyor, London Fruit Exchange, Duval Street, Spitalfields, E.1.

**March 16.—Australia.**—Two automatic voltage regulators complete with all accessories for regulating alternators No. 15 and 16 at Bulimba Station "B," City Electric Light Co. Ltd., Brisbane. B.o.T. (Ref. CRE (IB) 41851/50).*

**March 16.—Kidsgrove U.D.C.**—Mercury discharge street lighting (lamps and concrete columns). Contract No. 1: (*a*) Winchester-Preston trunk road (A.34 and A.5011) (Newcastle Road); (*b*) Stoke-on-Trent-Middlewich-Delamere trunk road (A.50) (Liverpool Road). Contract No. 2: Congleton Road, Butt Lane (A.34). Contract No. 3: Ashenough estate. Contract No. 4: Crown Bank estate. Contract No. 5: Galleys Bank estate. M. R. Gethin, engineer and surveyor, Town Hall, Kidsgrove.

**March 16.—Morocco.**—One 950 kW and two 2,000 kW generator sets. M. l'Ingenieur en Chef des Travaux Publics d'Etat. Administration Internationale de Tangier. B.o.T. (Ref. CRE (IB) 40516/50).*

**March 16.—South Africa.**—Stranded, hard-drawn, bare copper conductor: 20 tons of .1 (7/.136), 10 tons of .05 (3/.147) and 25 tons of .025 (3/.104). Twenty miles of 3/.036 (.003) varnished cambric-insulated annealed copper conductor, and 60 miles of 7/.044 (.01) varnished cambric-insulated hard-drawn copper conductor. City Engineer, Electricity House, Strand Street, Cape Town. B.o.T. (Ref. CRE (IB) 42732/50).*

**March 16.—Tangiers.**—Three diesel-electric generating sets; one 950 kW, two 2,000 kW. Monsieur L'Ingenieur en Chef des Travaux Publics d' Etat, Administration Internationale de la Zone de Tangiers.

**March 17.—Uruguay.**—Teletyping equipment, comprising two transmitter-receivers. Administration Nacional de Combustibles Alcohol y Portland, Casilla de Correo 1090, Montevideo. B.o.T. (Ref. CRE (IB) 43223/50).*

*Due to limitation of space, Overseas Contracts are only published twice in the above section. A complete list is available for reference at our offices.*

**March 18.—Belfast T.C.**—33 kV, 1,000 MVA switchgear and accessories to form extension to existing Reyrolle switchgear and modifications to increase rating of present gear from 750 MVA to 1,000 MVA. Merz and McLellan, Carliol House, Newcastle-on-Tyne 1. Deposit £5 5s.

**March 20.—South Africa.**—11 MVA 20·5/6·6 kV transformers. Room 19, Head office, Electricity Department, President Street West, Johannesburg. Deposit £3 3s.

**March 20.—Uruguay.**—18,000 1·5 V telephone dry batteries. Usinas Electricas y Telefonos del Estado, Montevideo. B.o.T. (Ref. CRE (IB) 42120/50).*

**March 21.—Morocco.**—Group of 500 lines for extension of automatic telephone exchange at Tangier. Telefonica de Tangier S.A. B.o.T. (Ref. CRE (IB) 41923/50).*

**March 21.—New Zealand.**—Supply and delivery at Lyttelton, for Papanui substation, of 500 MVA 11,000 V, switchgear of the duplicate busbar, indoor, metalclad, drawout type, and accessories. State Hydro-Electric Department, Wellington.

**March 22.—Uruguay.**—Total of 76,400 metres 6,000 V and 132,200 metres 220 V armoured underground cables in various conductor sizes. Usinas Electricas y Telefonos del Estado, Montevideo. B.o.T. (Ref. CRE (IB) 42122/50).*

**March 24.—Edinburgh T.C.**—Electric lighting and power installations in 212 houses and 15 shops at Inch housing area. City Architect, City Chambers, Edinburgh.

**March 24.—Uruguay.**—Fifteen equipments for step-down transformer substations, 3-phase, 50 cycle per second at 6,300 V transformed to 220 V. Usinas Electricas y Telefonos del Estado. B.o.T. (Ref. CRE (IB) 42245/50). *

**March 27.—Australia.**—11 kV indoor type circuit breakers for Tallawarra power station required by Southern Electricity supply. Agent-General, New South Wales, Strand, W.C.2.

**March 28.—Argentina.**—Equipment for H.E. power centre and transformer station at "Pirquitas" in the province of Catamarca. Directorate-General of Water and Electrical Power, Buenos Aires. B.o.T. (Ref. C.R.E. (IB) 30048/50).*

**May 1.—South Africa.**—Supply, delivery and erection of plant and materials for electricity supply undertaking, Contract A, comprising 40 kW and 15 kW oil engine-driven generating sets, switchgear, transformers, cables, complete low-tension distribution network and house service connections. Town clerk, Port St. Johns. Deposit £3 3s.

**No date stated.—Seaton Valley U.D.C.**—Electricity installation in 24 houses on Blyth Street est ite. Seaton Delaval. T. W. Burgess, Council Surveyor.

**No date stated.—Redcar T.C.**—Supply of public address system for use in connection with beach patrol service. Town Clerk, H. Caldwell, Municipal Buildings, Redcar.

## CONTRACTS CLOSED

**Luton T.C.**—Electrical work for 220 houses on Farley Hill estate. MONK AND CO., £7,599 (recommended).

**Plymouth T.C.**—Electrical installation at Efford secondary school. DEVON ELECTRIC AND GENERAL SERVICES LTD., £4,852 (recommended).

**Manchester T.C.**—Electrical installations for 160 houses (Contracts 66E, 66G, 69B, 70E and 71). A. E. SUDLOW AND CO. LTD. Electrical installations for 249 houses (Contracts 66F, 73, 78 and 87). H. C. TAYLOR AND CO. LTD.

**PRICES OF CABLE MATERIALS**
*(at Tuesday night)*

| | | | |
|---|---|---|---|
| COPPER, electrolytic ... ... ... | £153 | 0 | 0 |
| LEAD, good soft pig (foreign) ... ... | 97 | 0 | 0 |
| ,, ,, "English" quality ... | 98 | 10 | 0 |
| TIN (99·99·75%) ... (Cash) ... | £599½—£599¾ | | |
| ,, (3 months) ... ... ... ... | £584½—£584¾ | | |
| ALUMINIUM, commercial purity (del.) | 112 | 0 | 0 |
| ARMOURING: | | | |
| Galv. Steel Wire (0·104 in.) ... ... | 39 | 10 | 0 |
| Mild Steel Tape (0·04 in.) ... ... | 26 | 0 | 0 |
| **Note. Figures quoted are M.o.S. spot prices. For future prices the following premiums must be added:—** | | | |
| For Copper delivered in 2nd or 3rd month after order (per ton)... ... | 2 | 10 | 0 |
| For Copper delivered in 4th, 5th and 6th month after order (per ton) ... | 5 | 0 | 0 |
| For Lead delivered in 2nd or 3rd month after order (per ton) .. ... | 2 | 0 | 0 |

## GAZETTE ANNOUNCEMENTS

### COMPANIES ACTS

**Palace Electrical Co. Ltd.**—Resolution for voluntary winding up passed at meeting on February 3. Mr. M. S. Josephs, 36 Southampton Street, Strand, W.C.2, and Mr. A. W. Hunter, 185-188 High Holborn, W.C.1, appointed joint liquidators.

*Partnership Dissolved*

Partnership between EDWARD ERIC SHELTON and GILBERT ARTHUR RICHARD TOMES, carrying on business as research engineers and electronic manufacturers at Dunbar Works, West Norwood, S.E.27, dissolved by mutual consent as from October 31, 1949. Debts will be paid by G. A. R. Tomes, who is carrying on business.

## BUSINESS NOTICES

**Change of Name.**—The title of TRUE SCREWS LTD., has been changed to AYLESBURY TURNED PARTS (TRUE SCREWS) LTD.

**Works Extension.**—BEST PRODUCTS LTD., are extending their works at Felixstowe by the erection of an additional factory adjacent to the existing one. The new works will be devoted to electroplating and metal finishing services, up-to-date equipment being installed. The existing works are also being extended, by absorbing the area vacated by the present plating shop; the new space will be devoted to domestic electric appliances production.

**New B.E.A.M.A. Members.**—The following firms have been elected members of B.E.A.M.A.: CAMPBELL ENGINEERING CO. LTD., EASIPOWER LTD. (domestic electrical appliances section), DAVIDSON AND CO. LTD. (unattached), BARKER ELECTRIC CO. LTD. (domestic electric cooker section), BERKELEY AND YOUNG LTD. (ceiling and table fan sections), and INDESTRUCTIBLE PAINT CO. LTD. (insulations section).

## PROSPECTIVE BUSINESS

**Barnes T.C.**—Erection of 16 flats at Ranelagh Gardens, Rocks Lane, S.W.13. Borough Engineer and Surveyor, Municipal Offices, Sheen Lane, S.W.14.

**Bebington T.C.**—Erection of 56 dwellings at Brackenwood estate. Borough Engineer and Surveyor, Brackenwood, Higher Bebington.

**Bolton T.C.**—Erection of 20 one-bedroomed bungalows on Breightmet Hall estate. Housing Director, Town Hall, Bolton.

**Camberwell T.C.**—Compiling list of builders and contractors for repair work. Borough Engineer and Surveyor, Town Hall, Peckham Road, S.E.5.

**Camberwell T.C.**—Erection of 54 dwellings on site No. 6 (Cator Street and East Surrey Grove). Council's Architects, John Grey and Partner, 56 Oakley Street, S.W.1.

**Cleethorpes T.C.**—Erection of 40 cottage flats and 10 houses at Highgate housing site No. 4. Allan Cooper, Borough Engineer and Surveyor, Council House, Cleethorpes.

**Coventry T.C.**—Applications from builders and contractors for inclusion in list of tenderers for building. 60 flats, and 292 houses, bungalows and flatlets before March 14. City Engineer, Council House, Coventry.

**Croydon T.C.**—Modernisation of Surrey Street pumping station. Estimated cost £27,570. Water Engineer and Manager, Town Hall, Katherine Street, Croydon.

**Darlington T.C.**—The Finance Committee has applied to the Ministry of Health for sanction to borrow £5,750 for installing traffic lights at the junction of Blackwellgate, Grange Road, Coniscliffe Road and Skinnergate.

**Depwade R.D.C.**—Erection of 28 dwellings in various villages. A. F. Scott and Sons, Architects, 23 Tombland, Norwich.

**Doncaster T.C.**—Erection of 12 bungalows at Intake estate. Estates Surveyor, 15 South Parade, Doncaster.

**Doncaster T.C.**—Recommended to apply for sanction to borrow £3,200 for provision of electric cables on Clay Lane estate and for 106 houses on Wheatley Park estate.

**Failsworth U.D.C.**—(1) Erection of five shops with four flats at Propps Hall. Council's Architects, Harry S. Fairhurst and Son, Chancery Chambers, 55 Brown Street, Manchester 2. (2) Erection of 8 three bedroomed and 2 two bedroomed houses at Propps Hall and Bardsley estates. Engineer and Surveyor, Town Hall, Failsworth.

**Glasgow**—Replacement of entire electric lighting equipment in Royal Scottish Museum.

**Holyhead U.D.C.**—Construction of 22 houses on London Road (No. 2) site. R. E. Price, Housing Architect, Town Hall, Holyhead.

**Horncastle U.D.C.**—Erection of 40 houses on site between Boston Road and Mareham Road. Architects, Wm. Saunders and Partners, 24 Castle Gate, Newark-on-Trent.

**Leamington Spa T.C.**—Erection of 42 houses at Tackbrook Road. Architects, Rayner and Fedeski, 28 The Parade, Leamington Spa.

**Liverpool T.C.**—104 washing machines, 5-6 c ft capacity, and 20 hydro extractors, 21 in fixed bearing for various wash houses. Baths manager and engineer, Harold Davies Bath, East Prescot Road, Liverpool 14.

**London L.C.C.**—Education Committee propose to invite tenders for electrical installations in eight primary and secondary schools and two special schools in the second group of the fourth programme. Estimated cost £30,000.

**Nottingham Education Committee.**—Erection of assembly hall, kitchen and dining room at Wigman Road infants school, Bilborough, Nottingham. R. M. Finch, city engineer and surveyor, Guildhall, Nottingham.

**Oldham T.C.**—Erection of 36 one-bedroom bungalows on Limeside estate. Cameron and Middleton, chartered quantity surveyors, 32 Deansgate, Manchester 3.

**Seaton Valley U.D.C.**—To erect electricity substation on Blaketown housing estate, Seghill.

**Stockton-on-Tees. Education Committee.**—To spend £1,495 installing tubular heating at Bailey Street school, plus a further £500 for the necessary cable.

**Sunderland.**—R. G. Gregory and Partner, Pilgrim House, Pilgrim Street, Newcastle-on-Tyne, have been asked by the E.C. to prepare specifications for converting certain schools from gas to electric lighting.

**Torquay T.C.**—Erection of 70 houses on Marldon Road estate. Borough surveyor, Town Hall, Torquay.

## YOUR QUERIES ANSWERED

**"Wego" lighting auxiliaries,**—makers of? T.E.—Wego Condenser Co., Wego Works, Bideford Avenue, Perivale. (17685)

**"Maxwell" washing machines,** service for? Y.E.B.—We have been unable to trace service agent in Britain for Maxwells Ltd., of St. Mary's, Ontario. The Metalcraft Manufacturing Co. (Canada) Ltd., of 72 Newman Street, London W.1, offer to assist. (17689)

**"Aerofier" fan/heater,** makers of? T.E.—Kent Alloys Ltd., Strood, Kent, but the sole concessionaires are C. J. Fox and Sons Ltd., 117 Victoria Street, London S.W.1. (17692)

**Lead seals for meters,** makers of? T.E.—Acme Lead Seal Co., Furndale Road, Leytonstone E.11; Porter Patent Safety Seals Ltd., 7 Belfast Road, Stoke Newington, N.16; Grey and Marten Ltd., Southwark Bridge, London S.E.1; Associated Lead Manufacturers Ltd.; Ibex House, Minories, E.C.3. (17698)

**"Brightglow" immersion heater,** makers of? T.E.—The manufacturers Brightglow, Ltd., went out of business in 1948. (17704)

*The above are selected from the questions we have answered this week. If you have a query, send it to us.*

### ANSWER WANTED

**"Arcon" fluorescent fittings,** makers of? T.E. (17709)

## COMPANY REGISTRATIONS

*Extracted from the Register issued by Jordan and Sons, Ltd., 116 Chancery Lane, London, W.C.2.*

**A. R. Mitchell (Shrewsbury) Ltd.**, 32 St. John's Hill, Shrewsbury. Elec. engineers, etc. Cap.: £3,000. Permt. dirs.: A. R. Mitchell and J. E. Rogers.

**Ega Developments Ltd.** Wholesalers and retailers of electrical, radio, television and mechanical apparatus, appliances and accessories, etc. Cap.: £10,000. Dirs.: C. H. Bennett, W. T. Riley and F. A. W. Payne.

**E.R. Appliance Manufacturing Co., Ltd.**, 32 Victoria St., S.W.1. To take over business of a repairer of vacuum cleaners, hair dryers and electrical appliances carried on as "Electro-Reps" by Dudley G. Critchett, off High Rd., Leytonstone, E.11. Cap.: £10,000. Dirs.: D. G. Critchett, Mrs. D M. Clark.

**R. V. Battery Separator Co. Ltd.**, Victoria Buildings, High Road, Whetstone, N.20. Cap.: £3,000. Dirs.: R. H. Vaissiere and G. J. Robertson.

**Wm. H. Hann (Engineers) Ltd.**, Dorset. To take over business of a motor, general and electrical engineer carried on at Bridport by Wm. H. Hann. Cap.: £5,000. Dirs.: W. H. Hann and Gladys M. Hann.

**West Sussex Electrical Co., Ltd.**, 7 Grange Parade, Rustington, Sussex. Cap.: £1,000. Dirs.: J. H. Plant, H. W. Hibben, Joan Plant and Lorna E. M. Hibben.

## TRADE MARK APPLICATIONS

*This information is extracted from the Official Journal by permission of the Controller.*

**Broadcrete.** 679,390. Class 19. Lamp posts, lamp standards and lighting beacons all made of reinforced concrete. Broads Mfg., Co., Ltd., 2-4 South Wharf, Paddington, London W.2.

**Crystella.** B680,234. Class 11. Lamps, electric lamp bulbs, lamp glasses, lamp globes and lampshades. Glass Wholesale Supplies, Ltd., Torrens Works, Torrens Street, London E.C.1.

**Dynatherm.** B681,506. Class 9. Measuring instruments. Electronic Instruments, Ltd., 17 Paradise Road, Richmond, Surrey.

**Rap,** with design. 682,041. Class 9. Radio reception and transmission apparatus. Manufacturing Rap, Ltd., 145 Ewell Road, Surbiton, Surrey.

**Remploy,** with design. 674,151. Class 9. Electrical apparatus and instruments; wireless sets (complete), etc. Remploy Ltd., Egginton House, 25-28 Buckingham Gate, London S.W.1.

**Tapedeck.** 684,413. Class 9. Apparatus for recording, reproducing and amplifying electric oscillations, and parts thereof. Wright and Weaire Ltd., 138 Sloan Street, London S.W.1.

**Tufnol.** 683,694. Class 17. Electric insulating material, electric insulation parts and electric insulators. Tufnol Ltd., Wellhead Lane Works, Wellhead Lane, Perry Barr, Birmingham, 22b.

# MEETINGS TO NOTE

### THURSDAY, FEBRUARY 23

JNR. INSTN. ENGRS. (proposed E. Midland group).—Three ten-minute papers followed by discussion. Mechanics Institute, Burton Street, Nottingham.—7 p.m.

E.A.W.—"Points to look for in choosing your new Electrical Equipment for the Home," Miss Reading. 35 Grosvenor Place, S.W.1.—2.15 p.m.

### FRIDAY, FEBRUARY 24

I.E.E.—"The Application of Gas Turbine Technique to Steam Power," J. F. Field. Joint meeting with Institution Mech. Engrs. Storey's Gate, St. James's Park, S.W.1.—5.30 p.m.

I.E.E. (N.E. Students section).—"Switchgear—Old and New," T. W. G. Hart and K. W. Stanger. Grey Hall, King's College, Newcastle.—7 p.m.

POLYTECHNIC ELECTRIC ENGINEERING DEPT.—"High Frequency Heating in Industry." Members of the Research and Design staff, Redifon Ltd. Polytechnic, 307-311 Regent Street, W.1.—6.30 p.m.

E.P.E.A. (Stoke-on-Trent meeting).—"Television," I. N. Vaughan Jones. Service centre, Midlands Electricity Board's showrooms, Kingsway.—7 p.m.

### SATURDAY, FEBRUARY 25

ASSN. MINING ELECTRICAL AND MECH. ENGRS. (Yorkshire N. West branch).—"Sequence Control," Mr. Hayden. Queens Hotel, Barnsley.—3 p.m.

### MONDAY, FEBRUARY 27

A.S.E.E. (Bournemouth branch).—"Lift Control Gear." W. T. Wagon. Wedgewood Restaurant, Albert Road, Bournemouth.—8.15 p.m.

ROYAL SOCIETY OF ARTS.—"Public Lighting." J. M. Waldram. R.S.A., John Adam Street, Adelphi, W.C.2.—8 p.m.

I.E.E. (Radio section).—"Mobile Radio Power Packs," Air Commodore R. L. Phillips. Institution, Savoy Place, W.C.2.—5.30 p.m.

JNR. INSTN. ENGS. (Sheffield and district section).—"Mechanical Aids in the Operation of Rolling Mills," J. S. Mayne. Sheffield Metallurgical Club, 198 West Street, Sheffield.—7.30 p.m.

### TUESDAY, FEBRUARY 28

LUTON ELECTRICAL SOCIETY.—"The A.C. Commutator Motor." O. B. Charlton. Luton Chamber of Commerce, George Street West, Luton.—7.30 p.m.

I.E.E. (N. Western centre).—"Radio Astronomy," A. C. B. Lovell. Engineers Club, Manchester.—7 p.m.

### WEDNESDAY, MARCH 1

I.E.E. (Scottish centre).—"Some Electromagnetic Problems." Prof. G. W. O. Howe. Heriot-Wall College, Edinburgh.—7 p.m.

I.E.S. (Newcastle centre).—"Flood-lighting Practice," M. W. Peirce. Minor Durant Hall, Oxford Street, Newcastle-on-Tyne.—6.15 p.m.

### THURSDAY, MARCH 2

I.E.E. (London meeting).—"Some Electrical Methods of Measuring Mechanical Quantities." F. J. Woodcock. Institution Lecture Theatre, Savoy Place, W.C.2.—5.30 p.m.

A.S.E.E. (S. London branch).—"Motor Control Gear." R. F. Mathieson. Cafe Royal, Croydon.—8 p.m.

I.E.E. (Bristol students' section).—Joint brains trust with Inst. Mech. Engrs. (Graduate section). Electricity House, Bristol.—7 p.m.

INST. RADIO ENGRS. (Scottish section).—"The Limitations of the Loud Speaker." P. J. Walker. Heriot-Wall College, Edinburgh.—6.45 p.m.

### FRIDAY, MARCH 3

A.S.E.E. (Liverpool branch).—"Ball and Roller Bearings." The Skefko Ball Bearing Co. Ltd., M. and N.W.E. Bd. Lecture Theatre, Whitechapel, Liverpool.—6.30 p.m.

INC. PLANT ENGRS. (Birmingham branch).—"Submersible Electric Motors and Centrifugal Pumps." C. Norman Terry. Imperial Hotel, Birmingham.—7.30 p.m.

*An installation of large Hackbridge transformers in Australia.*

# HACKBRIDGE TRANSFORMERS

*A Hewittic Rectifier installation supplying d.c. to motor-driven plant at a gasworks.*

# Hewittic Rectifiers

**HACKBRIDGE Transformers and HEWITTIC Rectifiers have built up leading reputations in their respective fields of a.c. and d.c. electricity supply.**

**Modern developments in electricity distribution, industry, and electric traction, are making ever-increasing demands, both at home and overseas, for this world-famous equipment.**

HACKBRIDGE AND HEWITTIC ELECTRIC CO. LTD., WALTON-ON-THAMES, SURREY

*Telephone: Walton-on-Thames 760 (8 lines) Telegrams: "Electric," Walton-on-Thames*

**All the newest technical improvements available to contractors will make this new estate a worthy contribution to the housing problem. It will make big demands on electrical services for its many domestic needs. So, METALLIC conduits will assuredly be specified — chosen for its unfailing reliability, meticulous accuracy and simplicity of assembly. METALLIC is processed from laboratory-tested flawless metal —**

***The SAFE conduit for SAFE conduct***

# METALLIC

## CONDUIT TUBE AND FITTINGS

**THE METALLIC SEAMLESS TUBE CO. LTD.**
**LUDGATE HILL, BIRMINGHAM. TEL: CEN 7167.**
Also at London, Newcastle-on-Tyne, Leeds, Swansea and Glasgow.

A TI COMPANY

# CLASSIFIED ADVERTISEMENTS

*Official Tenders and Appointments • Situations Vacant • For Sale • Wanted*

## TENDERS INVITED

### BOROUGH OF SLOUGH

STREET LIGHTING

TENDERS are invited for the whole or any section of the following works in connection with the provision of Street Lighting on Stoke Poges Lane (East) Housing Estate.

(a) Provision of 42 pre-cast concrete columns.
(b) Provision of 42 lanterns, together with 80 watt mercury vapour lighting equipment.
(c) Erection of columns and installation of lighting equipment.

General conditions of contract and terms may be seen, and specification and bills of quantities may be obtained from the Borough Engineer, Town Hall, Slough, Bucks, on payment of a deposit of £1 1s, which will be refunded on receipt of a bona-fide tender.

Tenders in plain sealed envelopes endorsed "Street Lighting—Stoke Poges Lane (East) Estate," must be delivered to the undersigned not later than noon on Monday, March 13, 1950.

The Council do not bind themselves to accept the lowest or any tender.

NORMAN T. BERRY,
Town Clerk.

Town Hall, Slough, Bucks.
February 22, 1950. (D 716)

### BOROUGH OF SLOUGH

MOTOR TOWER WAGON

TENDERS are invited for the supply of one Motor Tower Wagon suitable for street lighting maintenance. The extended height of the platform should be 25 ft and the ladder is to be mounted on a petrol-engined chassis with accommodation for fitters' tools and equipment.

Form of tender and general specification may be obtained from the Borough Engineer, Town Hall, Slough, Bucks.

Tenders in plain sealed envelopes, endorsed "Motor Tower Wagon," must be received by the undersigned not later than noon on Monday, March 13, 1950.

The Council do not bind themselves to accept the lowest or any tender.

NORMAN T. BERRY,
Town Clerk.

Town Hall, Slough, Bucks.
February 22, 1950. (D 717)

### CITY AND COUNTY BOROUGH OF BELFAST

*Electricity Department*

TENDERS are invited for the supply, delivery and erection at the Belfast Harbour Power Station of :—

33kV, 1,000 MVA SWITCHGEAR and ACCESSORIES to form an extension to existing Reyrolle Switchgear, and modifications to this existing switchgear including the increase of its rating from 750 MVA to 1,000 MVA.

Form of tender, in quadruplicate, conditions of contract, specification and drawings may be obtained from Messrs. Merz and McLellan, consulting engineers, Carliol House, Newcastle-upon-Tyne 1, on payment of a deposit of five guineas (cheques to be made payable to the Belfast Corporation Electricity Department), which deposit will be refunded provided a bona fide tender be lodged and not withdrawn. Extra copies of the contract documents may be obtained at three guineas per set which sum will not be returnable.

Each tender, in quadruplicate, in sealed envelope marked "Tender for 33kV Switchgear, Harbour Power Station," and endorsed with the name and address of the firm tendering must reach the undersigned not later than 12 noon, on Saturday, March 18, 1950.

An official receipt must be obtained for each tender delivered by hand. Tenders sent by post should be registered.

JOHN DUNLOP,
Town Clerk.

City Hall, Belfast.
16.2.50. (D 724)

**BOX No. replies to be addressed to the ELECTRICAL TIMES, Sardinia House, Sardinia Street, London W.C.2**

## APPOINTMENTS VACANT

*None of the vacancies in these columns relate to a man between the ages of 18 and 50 inclusive, or a woman between the ages of 18 and 40 inclusive, unless he or she is excepted from the provisions of the Control of Engagement Order, 1947, or the vacancy is for employment excepted from the provisions of that Order.*

### SOUTH WALES ELECTRICITY BOARD

*Central Sub-Area*

APPLICATIONS are invited for the position of OVERHEAD POWER LINESMAN in District 349 (Barry).

Applicants must be able to carry out all work in connection with the erection and maintenance of overhead transmission and distribution, service and street lighting lines and any equipment and apparatus in connection therewith.

The wage will be in accordance with the agreement of the National Joint Industrial Council for the electricity supply industry, which at present is 2s. 10d. per hour for a 44-hour week.

The position is subject to the conditions laid down in the N.J.I.C. agreement.

Applications, in envelopes endorsed "Overhead Power Linesman," are to be sent to the Central Sub-Area Administrative Officer, Electricity Offices, The Hayes, Cardiff, not later than seven days from the publication of this advertisement.

A. J. CHANNING,
Sub-Area Manager.

Central Sub-Area, Electricity Offices,
The Hayes, Cardiff.
February 14, 1950. (D 683)

### BRITISH ELECTRICITY AUTHORITY

*East Midlands Division*

JUNIOR SHIFT CHARGE ENGINEER—AVON

APPLICATIONS are invited for the position of Junior Shift Charge Engineer at Avon Generating Station, Warwick.

Candidates should have had a sound general and technical education, and have experience in the operation of steam power stations.

The salary will be in accordance with the National Joint Board Schedule, Class "H," Grade 9A, at present £396 per annum. This salary is provisional and subject to negotiations.

Forms of application may be obtained from the Divisional Establishments Officer at the undermentioned address, and should be returned to him not later than March 8, 1950.

W. S. BURGE,
Divisional Controller.

British Electricity House,
Barker Gate, Nottingham. (D 685)

### EASTERN ELECTRICITY BOARD

*Suffolk Sub-Area*

APPOINTMENT OF DISTRICT ENGINEER

APPLICATIONS are invited for the position of District Engineer in the Woodbridge District of the Suffolk Sub-Area at a provisional salary of £600 per annum. The successful candidate will be responsible to the District Manager for the engineering work of the District. Applicants should preferably be Corporate Members of the Institution of Electrical Engineers and should have had extensive experience of h.v. and l.v. overhead and underground distribution systems in a predominantly rural area.

The future salary and the conditions of employment will be in accordance with the terms and conditions laid down from time to time by the appropriate negotiating body. The successful candidate will be required to contribute to a superannuation scheme and may be required to undergo a medical examination.

Applications stating age, education, qualifications, experience, present appointment and salary, together with the names of two referees, should be addressed to the Manager, Woodbridge District, Eastern Electricity Board, Electricity House, Cumberland Street, Woodbridge, Suffolk, so as to reach him within 14 days of the appearance of this advertisement.

December 16, 1949. (D 713)

## MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

ENGINEERING APPOINTMENTS

APPLICATIONS are invited for the following appointments on the engineering staff of the Board, at commencing salaries according to qualifications and experience and within the ranges quoted below:

(1) ASSISTANT SECTION ENGINEERS (two)
(a) Warrington district, No. 2 Sub-Area, at a salary within the range £425-£475 p.a.
(b) Chester district, No. 3 Sub-Area, at a salary within the range £400-£450 p.a.

Applicants for posts 1(a) and 1(b) should have a good general education and be graduates of the Institution of Electrical Engineers, or possess the Higher National Certificate in Electrical Engineering. Preference will be given to candidates with some experience of h.t. and l.t. overhead and underground distribution.

(2) SECTION ENGINEERS (two)
(a) St. Helens district, No. 2 Sub-Area, at a salary within the range £550-£600 p.a.
(b) Birkenhead district, No. 3 Sub-Area, at a salary within the range £550-£600 p.a.

Applicants for posts 2(a) and 2(b) should possess the Higher National Certificate and preference will be given to Chartered Electrical Engineers with experience in all branches of work associated with distribution, including the design, construction and operation of e.h.t., h.t., and l.t. overhead and underground systems including indoor and outdoor substation equipment. Experience in the commissioning and maintenance of protective gear will be an advantage.

(3) ASSISTANT TECHNICAL ENGINEERS (two)
No. 2 Sub-Area Headquarters, Northwich, at a salary within the range £550-£650 p.a.

Applicants for posts 3 should preferably be Chartered Electrical Engineers or hold a university degree in electrical engineering. The duties of the post will include the preparation of specifications, protective schemes and system calculations. Preference will be given to candidates who have served an apprenticeship with a manufacturer of electrical plant.

(4) TESTING ASSISTANT
Meter and Test Department, No. 4 Sub-Area Headquarters, Rhostyllen, Wrexham, at a salary of £500 p.a.

Applicants for post 4 should possess the Higher National Certificate or equivalent qualification in electrical engineering and should have had practical experience in the testing of relays, protective gear, high voltage and transformer testing including site testing.

In all these appointments the ability to drive a motor car is essential.

The salaries and salary ranges quoted are provisional and subject to any adjustment that may be necessary to conform to salary scales to be agreed after negotiation with the appropriate staff organisation.

The successful candidates may be required to satisfy the Board's medical adviser and if eligible will be required to contribute to a Superannuation Scheme.

Applications should be made on forms obtainable as below:—

Posts 1(a), 2(a), 3: The Manager, No. 2 Sub-Area, Electricity House, Sandiway, Nr. Northwich.

Posts 1(b), 2(b): The Manager, No. 3 Sub-Area, Electricity House, Newgate Street, Chester.

Post 4: The Manager, No. 4 Sub-Area, Electricity House, Rhostyllen, Nr. Wrexham.

Completed application forms should be returned to the office of origin so as to be received not later than Thursday, March 9, 1950.

JAMES RANKIN,
Secretary.
(D 719)

## EASTERN ELECTRICITY BOARD

*Norfolk Sub-Area*

COMMERCIAL ASSISTANT, KING'S LYNN AND WESTERN DISTRICT (HUNSTANTON BRANCH)

APPLICATIONS are invited for the appointment of Commercial Assistant in the King's Lynn and Western District of the Norfolk Sub-Area, from candidates who have had sound training in electricity supply industry, commercial practices and wide experience in the preparation of specifications and estimates for all forms of installation work. Experience in rural development would be an added qualification.

The provisional salary for this appointment will be £410 per annum, and future salary and conditions of service will be in accordance with agreements made from time to time through the appropriate negotiating bodies.

The successful applicant will be required to contribute to a Superannuation Scheme and may be required to undergo a medical examination.

Applications stating age, experience, education, qualifications and details of present appointment should be addressed to the District Manager, King's Lynn and Western District, Eastern Electricity Board, Gaywood Bridge, King's Lynn, to reach him not later than 14 days after the appearance of this advertisement.

February 17, 1950. (D 712)

## NORTH WESTERN ELECTRICITY BOARD

*No. 3 Sub-Area*

APPOINTMENT OF JOINTER, CLASS 1
STALYBRIDGE DISTRICT

APPLICATIONS are invited for the above position in the Stalybridge District of the No. 3 Sub-Area.

The terms and conditions of employment will be those laid down by the National Joint Industrial Council for the electricity supply industry, the present rate of pay being 33.0d. per hour for a 44-hour week.

Applications, stating age, present position and experience, should be received by E. Binns, Esq., A.M.I.E.E., M.I.Mech.E., Sub-Area Manager, No. 3 Sub-Area, The North Western Electricity Board, Greenhill Offices, Oldham, not later than Friday, March 10, 1950.

The above vacancy is advertised by permission of the Ministry of Labour and National Service under the Control of Engagement Order, 1947. (D 727)

## BRITISH ELECTRICITY AUTHORITY

*London Division*

CHARGE ENGINEER
HAMMERSMITH GENERATING STATION

APPLICATIONS are invited for the above position. Salary in accordance with N.J.B. Schedule, Class "H," Grade 8.

Technical education up to Higher National Certificate standard is required, including thermodynamics as a subject, and a good general education is desirable. Experience in the operation of medium-sized boilers and turbines is necessary, and character and administrative ability will be taken into consideration.

The appointment offers scope for experience to the right type.

Applications, stating age, qualifications and experience, should be addressed to Acting Divisional Secretary, British Electricity Authority, London Division, Ergon House, Horseferry Road, Westminster, S.W.1, to be received within fourteen days of the appearance of this advertisement.

J. N. WAITE,
Divisional Controller.
(D 709)

## CENTRAL ELECTRIFICATION SCHEME, CYPRUS

A RESIDENT MECHANICAL AND ELECTRICAL ENGINEER required in connection with the Central Electrification Scheme in Cyprus to supervise the installation of mechanical and electrical plant in a new thermal power station to be constructed at Dekhelia (about 8 miles east of Larnaca, Cyprus) and the construction of a 66 kV and 11 kV overhead transmission system in the Island. Work on site is expected to commence early in 1950, and will be spread over a period of about three years.

Applicants should be corporate members of either the Institution of Mechanical Engineers or the Institution of Electrical Engineers, and should have had previous experience of power station construction and transmission line work.

The initial salary of the post will be £1,350 per annum with annual increases of £50 per annum up to a maximum of £1,500 per annum.

Furnished quarters will be provided by the Government of Cyprus in the vicinity of the power station. In the event of these quarters not being ready for occupation at the commencement of site work an allowance in accordance with local rates, but not exceeding 10s. per day for single men or 20s. per day for married men will be paid. The Government will also provide such local transport as is necessary for the work, but this will not be available for private purposes.

First-class passages up to a maximum of three will be paid from England to Cyprus at the commencement of duty for the successful applicant and his family, and also from Cyprus to England on satisfactory completion of the engagement. Air travel may be necessary at the option of the Government of Cyprus.

The selected candidate will be required to pass an examination by the Medical Officer of the Crown Agent for the Colonies.

Leave with pay at the rate of 2½ days per completed month of residential service will be granted after the completion of the duties for which the candidate is engaged.

Applications, giving age, qualifications, experience and copies of recent testimonials, and also the date when available should be addressed to: Messrs. Preece, Cardew and Rider, 8 and 10 Queen Anne's Gate, Westminster, S.W.1.

The successful candidate will, subject to satisfactory service during the construction period, subsequently be considered for an appointment on the permanent staff at a salary which will be determined later, but will not necessarily be the same as that paid to him as Resident Engineer. (D 707)

## MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

AUDIT ASSISTANT

APPLICATIONS are invited for the appointment of Audit Assistant on the Internal Audit section of the Chief Accountant's Department at the Headquarters of the Board, Electricity House, Love Lane, Liverpool 3.

The salary payable will be within the range of £450-£761 p.a. according to qualifications and experience, and will be subject to such adjustment as may be necessary to conform to the scales of salary subsequently agreed with the appropriate staff organisation.

Applicants must be qualified accountants and should have had audit experience either with a professional accountant in general practice or in the internal audit section of a large undertaking.

The successful candidate will be required to satisfy the Board's Medical Adviser and to contribute to a superannuation scheme.

Applications, endorsed "Audit Assistant," should be addressed to the Chief Accountant at the above address, so as to reach him not later than March 8, 1950.

JAMES RANKIN,
Secretary.
(D 697)

## LEEDS COLLEGE OF TECHNOLOGY

*Department of Electrical Engineering and Physics*

*Principal:* C. CHEW, M.Sc.Tech., F.R.I.C.

APPLICATIONS are invited for the post of full-time LECTURER in ELECTRICAL ENGINEERING, duties to commence in April next or as soon as possible thereafter. Applicants should be suitably qualified and have had industrial and teaching experience.

Salary in accordance with the Burnham Scale, viz. £300 by £15 to £556 together with a special allowance of £75, and additions for degree and approved training. Industrial and teaching experience and war service will be taken into account in fixing the commencing salary.

Particulars and form of application, to be returned not later than three weeks after the appearance of this advertisement, may be obtained by sending a stamped-addressed foolscap envelope to the Chief Education Officer, Education Department, Leeds 1. (D 722)

## BRITISH ELECTRICITY AUTHORITY

*South Wales Division*

APPLICATIONS are invited for the appointment of WORKS INSPECTOR (temporary) in the Construction Department at Divisional Headquarters, to be centred at the Uskmouth Generating Site.

The salary, which is provisional and subject to negotiation, will be £4.0 per annum.

Applicants should have been engaged on large civil engineering works involving pile driving, bulk excavation, heavy foundation and superstructure work. A knowledge of the sinking of caissons and compressed air work, together with experience in the checking of the erection of structural steel buildings would be considered an advantage.

Forms of application may be obtained from the Divisional Secretary at the address below to whom completed applications should be returned not later than March 10, 1950 in sealed envelope endorsed "Works Inspector."

H. V. PUGH,
Divisional Controller.

Cardiff (Pengam Moors) Airport, Cardiff.
February 17, 1950. (D 721)

## BRITISH ELECTRICITY AUTHORITY

*Eastern Division*

APPLICATIONS are invited for the following appointment:—

SHIFT CHARGE ENGINEER, Thorpe Generating Station, Norwich.

Salary in accordance with N.J.B. Schedule, Grade 8, Class "d" (£520-£547 per annum).

Applicants should have served an apprenticeship and obtained an Ordinary National Certificate in Electrical and or Mechanical Engineering or equivalent and possess experience in the operation of Power Stations.

The salary is in accordance with the scale at present operating but may be subject to negotiation through the medium of the Joint Board.

The appointment will be superannuable in accordance with the British Electricity Authority and Area Boards' Superannuation Scheme.

Applications, stating age, experience and present position, should be sent to the Divisional Controller, British Electricity Authority, Eastern Division, Northmet House, Southgate N.14, to arrive not later than March 11, 1950. Envelopes should be endorsed "Shift Charge Engineer, Norwich."

W. N. C. CLINCH,
Controller.

Northmet House, Southgate, N.14. (D 694)

## SOUTH WEST SCOTLAND ELECTRICITY BOARD

*Clyde Sub-Area*

APPOINTMENT OF DISTRICT ENGINEER

APPLICATIONS are invited for the appointment of District Engineer in the Greenock District.

Candidates should have had a sound training in electrical engineering and considerable experience in the operation and maintenance of high and low voltage networks (overhead and underground) and sub-stations, the supervision of constructional work and the keeping of essential records of mains and sub-stations equipment and layouts.

The salary, which is provisional and subject to negotiations by the appropriate body, will be in accordance with the National Joint Board Schedule, Class "G", Grade 3, £730-£761 per annum.

Candidates should preferably be corporate members of the Institution of Electrical Engineers or have equivalent qualifications.

The appointment will be superannuable in accordance with the British Electricity Authority and Area Boards' Superannuation Scheme.

Applications stating age, education, qualifications and experience, present position and salary, should be received by the Manager, 206 St. Vincent Street, Glasgow, within fourteen days of the appearance of this advertisement.

DANIEL ROSS,
Manager.
(D 718)

## BRITISH ELECTRICITY AUTHORITY

*London Division*

STATION SUPERINTENDENT
WOOLWICH GENERATING STATION

APPLICATIONS are invited for the above position. Salary and conditions in accordance with the N.J.B. Schedule, Class "K."

Applicants should have had sound operating and maintenance experience in a medium or large capacity Generating Station, and should possess good technical qualifications.

Applicants should also have keen administrative ability, possess tact, and be capable of handling personnel to the number of 300.

The appointment will be subject to Superannuation under the terms and conditions of the B.E.A. and Area Boards' Scheme.

Applications, stating age, experience and present salary, should be addressed to the Acting Divisional Secretary, British Electricity Authority, London Division, Ergon House, Horseferry Road, Westminster, S.W.1, and be received not later than three weeks after the date of this advertisement.

J. N. WAITE,
Divisional Controller.
(D 702)

## THE STATES OF GUERNSEY

APPLICATIONS are invited for the appointment o ENGINEER-MANAGER of the States of Guernsey Electricity Department. The department supplies the Island of Guernsey, C.I., an area of about 25 sq miles and population of over 44,000. The power station (Class D) generates entirely by diesel alternators and output at present is over 16 m. per annum. Staff employed is about 150.

Candidates must have had experience as a senior official in the control, management and development of an Electricity Supply Undertaking and will be expected to co-ordinate the technical, sales and accountancy sub-departments, plan extensions of plant, mains and sub-stations, and prepare statistics and estimates for presentation to the States Electricity Board and be responsible for carrying out its instructions and policy.

Candidates should hold either a university degree in engineering or be corporate members of the Institute of Electrical, Mechanical or Civil Engineers.

The successful candidate will be required to pass a medical examination.

Non-contributory pension rights are governed by the States Civil Service Pensions Rules. It is a condition of appointment that the appointee contribute to the Contingency Fund to provide pensions to widows and orphans of members of the States Civil Service. Particulars of pension rights and of Contingency Fund rights and obligations are obtainable on application to the States Supervisor, States Office, Guernsey.

Salary £1,080-£1,260. The commencing salary and increments will be fixed in accordance with the qualifications and experience of the successful candidate. In addition to salary there is a temporary cost of living bonus (£50 p.a. married men, £25 p.a. single men).

Applications giving age, qualifications and full experience, accompanied by the names of three referees, must be received not later than Monday, March 20, 1950, addressed to: The President, States Appointments Board, Royal Court, Guernsey, C.I.

Canvassing for appointment is forbidden. (D 714)

## YORKSHIRE ELECTRICITY BOARD

APPLICATIONS are invited for the following appointments:—

*No. 2 (Huddersfield) Sub-Area*

SENIOR ASSISTANT (STREET LIGHTING)
Vacancy No. 7/50

Applicants should have had a good general and technical education and be fully experienced in the general application of electricity for street lighting purposes and in relevant negotiations with Local Authorities.

Provisional salary £500 by £25 to £600 per annum, subject to negotiations with the appropriate organisations.

Applications, stating the above vacancy number, giving age and full details of training, qualifications, and experience, to be forwarded to the Manager, No. 2 (Huddersfield) Sub-Area, Yorkshire Electricity Board, Market Street, Huddersfield, within fourteen days of the appearance of this advertisement.

*No. 6. (Hull) Sub-Area*

DRAUGHTSMEN (GRADES I, II, AND III)
Vacancy No. 13/50

Candidates should have had experience in any or all of the following: architecture, building design and construction, structural steel work and bills of quantities. The duties will include the preparation of layouts and working drawings for offices, showrooms, and industrial buildings, also alterations to existing buildings.

Salaries, which are provisional, and subject to negotiations with the appropriate organisations, will be within the following scales according to qualifications and experience:—

Grade I, £400 by £25 to £500 per annum.
Grade II, £360 by £20 to £400 per annum.
Grade III, £290 by £20 to £350 per annum.

Applications, stating the above vacancy number, giving age and full details of qualifications and experience, should be forwarded to the Manager, No. 6 (Hull) Sub-Area, Yorkshire Electricity Board, Electricity Offices, Ferensway, Kingston-upon-Hull, within fourteen days of the appearance of this advertisement. (D 723)

## BRITISH ELECTRICITY AUTHORITY

APPLICATIONS are invited for the appointment of ASSISTANT to the FUEL TECHNOLOGIST in the Generation Operation Branch of the Chief Engineer's Department at Headquarters in London.

Applicants should have a fuel, engineering or chemical engineering degree or equivalent qualifications and a knowledge of the properties of British coals and their combustion, particularly in relation to suitability for use in power stations. Experience of the operation of large boilers and of the effect of fuel quality and cost on the economics of power station operation is essential.

The starting salary will be determined according to the qualifications and experience of the selected applicant within the 2nd Assistant range of £707 8s. to £969 18s. per annum and will be provisional until the final scale has been agreed with the appropriate negotiating organisations.

The appointment is superannuable and the successful candidate may be required to pass a medical examination.

Application forms may be obtained from D. Moffat, Director of Establishments, British Electricity Authority, British Electricity House, Great Portland Street, London W.1, and should be completed and returned to him not later than March 10, 1950. The information on the application form may be supplemented on separate sheets if the applicant so desires.

Please quote reference AE/48. (D 737)

## BRITISH ELECTRICITY AUTHORITY

APPLICATIONS are invited for the appointment of ASSISTANT to the SCIENTIFIC ADVISER in the Generation Operation Branch of the Chief Engineer's Department at Headquarters in London.

The duties will be connected with the various theoretical aspects of boiler availability and combustion, and to prepare technical reports thereon. Applicants should have a good honours degree in chemistry or chemical engineering or A.R.I.C. by examination or A.M.I.Chem.E. Industrial experience is essential, preferably in power stations. Some knowledge of microscopy would also be an advantage.

The starting salary will be determined according to the qualifications and experience of the selected applicant within the 2nd Assistant range of £707 8s. to £969 18s. per annum and will be provisional until the final scale has been agreed with the appropriate negotiating organisations.

The appointment is superannuable and the successful candidate may be required to pass a medical examination.

Application forms may be obtained from D. Moffat, Director of Establishments, British Electricity Authority, British Electricity House, Great Portland Street, London W.1, and should be completed and returned to him not later than March 10, 1950. The information on the application form may be supplemented on separate sheets if the applicant so desires.

Please quote reference AE/49. (D 738)

## NORTH OF SCOTLAND HYDRO-ELECTRIC BOARD

*Orkney Area*

APPLICATIONS are invited for the post of GENERATION ENGINEER. Applicants must have a minimum of ten years' experience in operating and maintaining diesel engines. Familiarity with public supply conditions desirable. Salary not less than £500 per annum depending on qualifications and experience and subject to adjustment by the appropriate negotiating machinery. Superannuation Scheme will apply. Applications to be forwarded to The Secretary, 16 Rothesay Terrace, Edinburgh 3, within seven days of the appearance of this advertisement. (D 726)

## NORTH OF SCOTLAND HYDRO-ELECTRIC BOARD

DISTRIBUTION ENGINEER required for the Board's Skye and Lochalsh Area. Salary, which will depend on qualifications and experience, will not be less than £500 per annum. Salary will be provisional in the first instance and subject to adjustment by the appropriate negotiating machinery.

Applications to: T. Nicolson, B.Sc., A.M.I.E.E., Area Manager, North of Scotland Hydro-Electric Board, Kyle of Lochalsh, Ross-shire. (D 715)

## ADMIRALTY

VACANCIES exist in the Admiralty for TECHNICAL AUTHORS at Admiralty Headquarters and in various Naval Establishments.

The duties are to prepare official technical publications and handbooks on armament, mechanical and electrical apparatus, radio equipment and underwater weapons, including Asdic, used in H.M. ships.

The posts will be graded in one or other of the ranges £625 by £25 to £750 or £500 by £20 to £625 according to qualifications and experience. Rates outside London will be a little lower.

Candidates should either have completed a regular engineering apprenticeship or equivalent training and possess technical knowledge to the standard of Higher or Ordinary National Certificate, or alternatively, have had extensive experience in one or other of the appropriate technical and specialist branches of the Royal Navy. Preference will be given to those who have had previous experience in technical writing. Appointments will be temporary but there may be long-term possibilities.

Write, quoting D.49/50-A, to Ministry of Labour and National Service, Technical and Scientific Register (K), York House, Kingsway, W.C.2, for application form which must be returned completed by April 1, 1950. (D 730

A LARGE firm of manufacturing electrical engineers in the Midlands have a vacancy for an EXPERIENCED ENGINEER for the design of industrial control gear apparatus, including all types of contactors, starters, regulators, etc. Education up to B.Sc. standard would be an advantage and some experience of design for quantity production desirable.—Apply, giving full details of experience, and quoting "Switchgear," to Staff Manager, Box No. 1879, Electrical Times. (D 728)

AN ELECTRICAL ENGINEER with experience of steelworks or other heavy engineering, required. Salary £800 upwards.—Reply to Box No. 1871, Electrical Times. (D 681)

APPLICATIONS are invited for the following positions in our Electric Motor Department: DESIGNER; WINDING SHOP FOREMAN; and TEST ENGINEER.—British Bronson Ltd., Stocklake, Aylesbury. (D 615)

CAPACITOR ENGINEER required, with good theoretical knowledge and preferably with some experience of design and production of P.F. Correction Capacitors. Salary according to qualifications.—Apply: Technical Director, Bryce Electric Construction Co., Ltd., Kelvin Works, Hackbridge, Surrey. (D 609)

CONSULTING Engineers have vacancies for young ELECTRICAL ENGINEERS wanting experience in heavy industrial installation work. Applicants must have degree or equivalent and be trained by one of the larger firms.—Reply to Box No. 1869, Electrical Times. (D 680)

CONTRACTS ENGINEER required, London area. Age 35-40. Estimating, costing, supervision. Full experience in p.i. cable and switchgear installations; jointing e.h.t. and l.t. excavation; o.h. line work. H.N. Certificate or equivalent. Permanent position and prospects. Apply, in writing, stating age, experience, and salary required.—Box No. 1863, Electrical Times. (D 675)

ENGLISH ELECTRIC require for their Acton Drawing Office, ELECTRICAL AND MECHANICAL DESIGN DRAUGHTSMAN for interesting work covering heavy electrical switchgear. Applicants should have a sound D.O. experience of switchgear work and preference will be given to those possessing the Higher National Certificate. Write, giving full details, quoting Ref. 113 to Central Personnel Services, English Electric Co., Ltd., 24 Gillingham Street, Westminster, S.W.1. (D 690)

EXPERIENCED ORDER CLERK at our Leyton Depot. State age, wages, experience.—M.D., Sloan Electrical Co. Ltd., 31-33 Bondway, S.W.8. (D 693)

EXPERIENCED TIME-STUDY ENGINEERS required for Philips Mitcham Works (radio, television, and light electrical engineers). Knowledge of Bedaux method of rating is essential.—Write, giving details of qualifications, experience, and salary required, to Personnel Officer, Mitcham Works, Ltd., New Road, Mitcham Junction, Surrey. (D 701)

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S.E. LONDON, opp. stn. Elect. instals. sales, repairs Shop, workroom and rooms above. Long lease, low rent. Good stock. All £800.—Box No. 1895, Electrical Times. (D 740)

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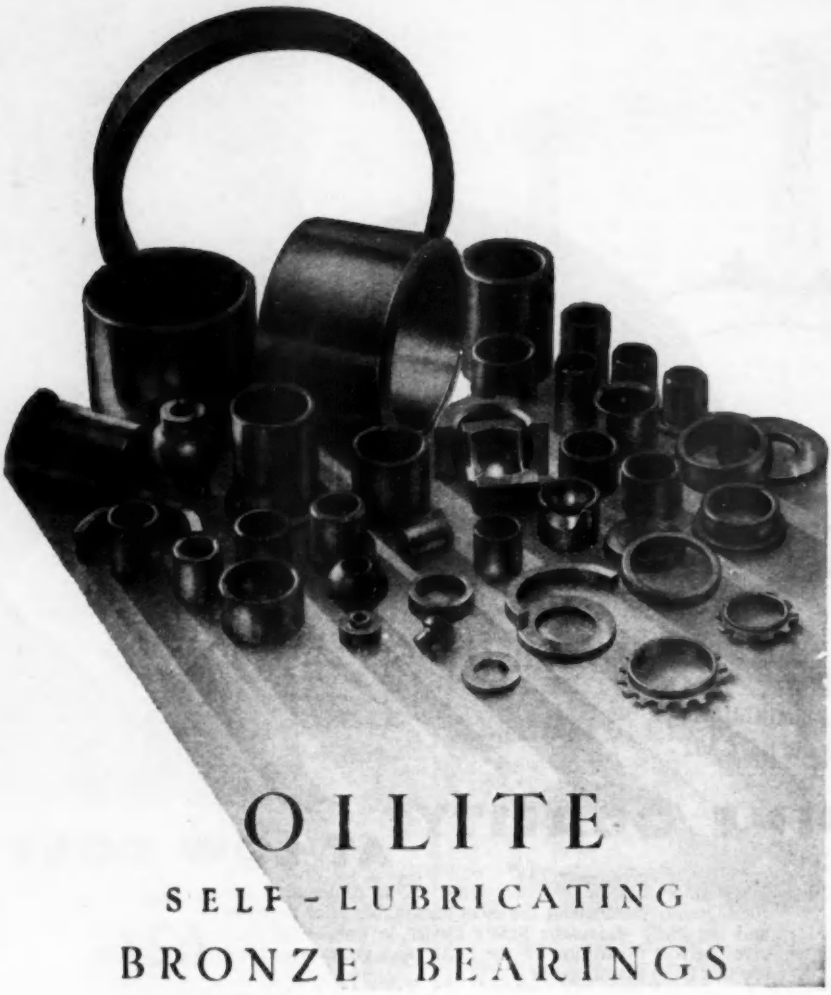

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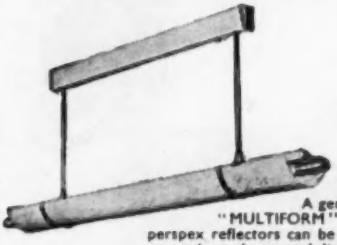

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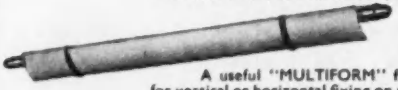

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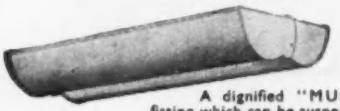

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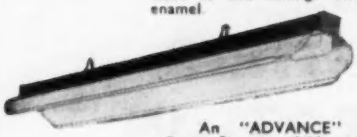

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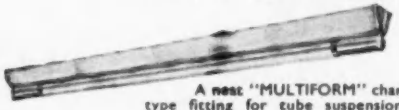

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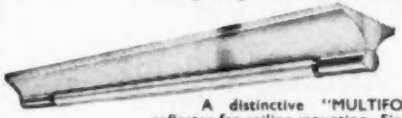

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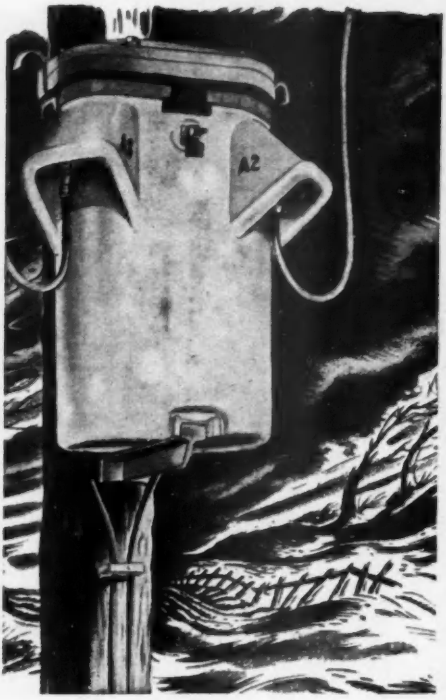

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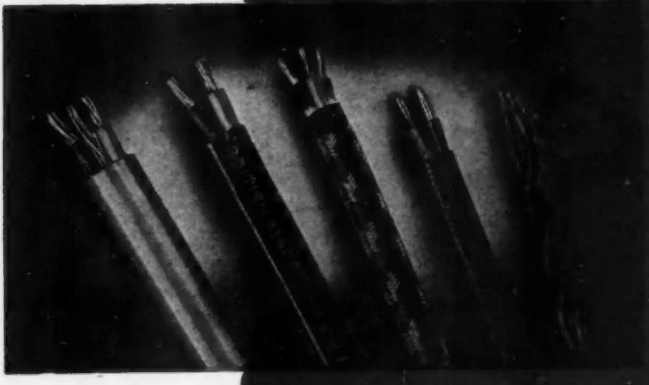

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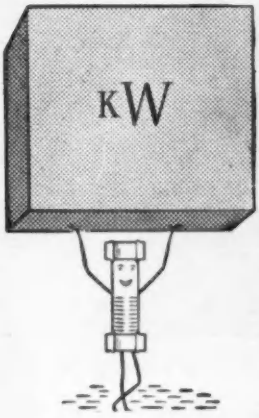


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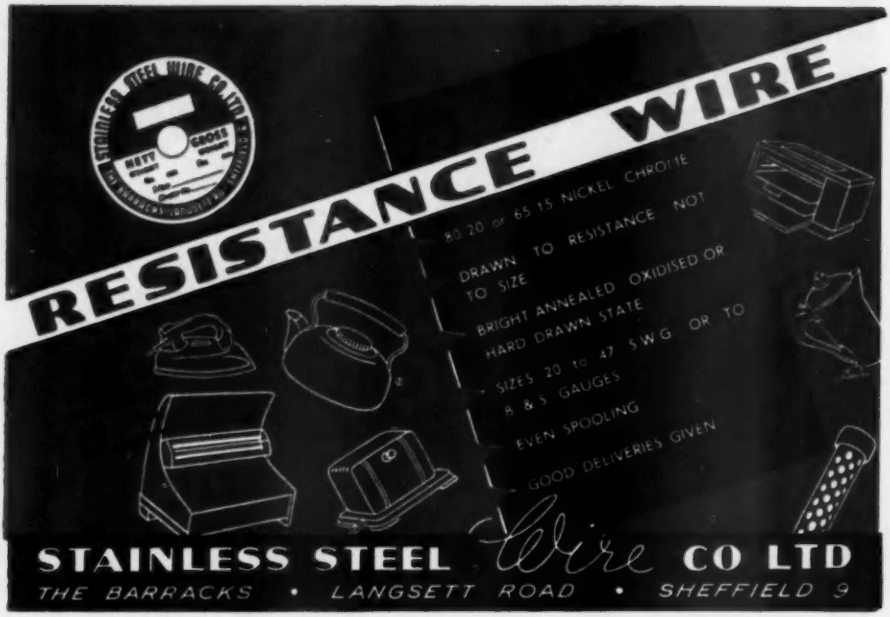
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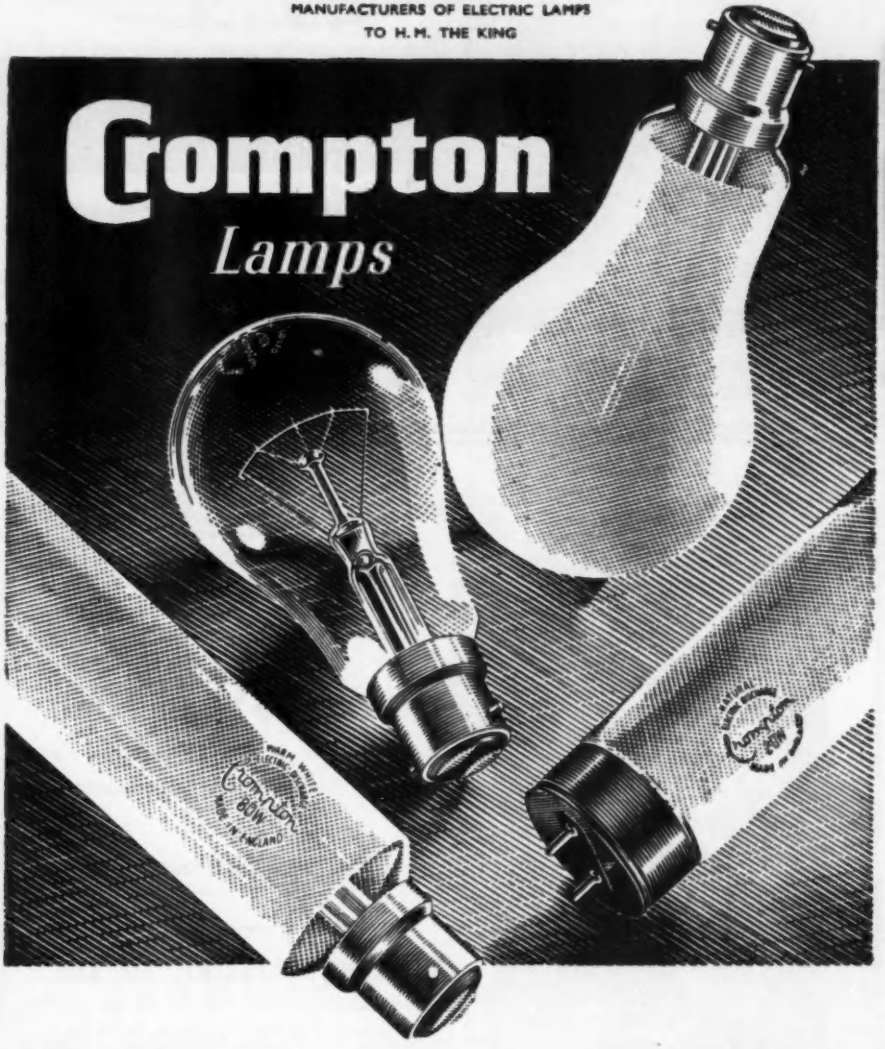


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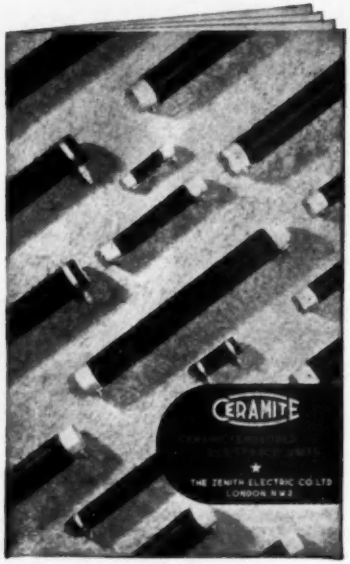


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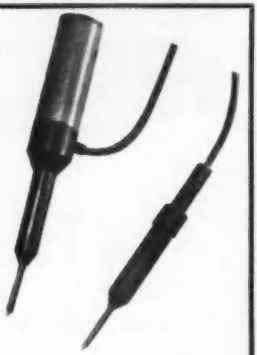

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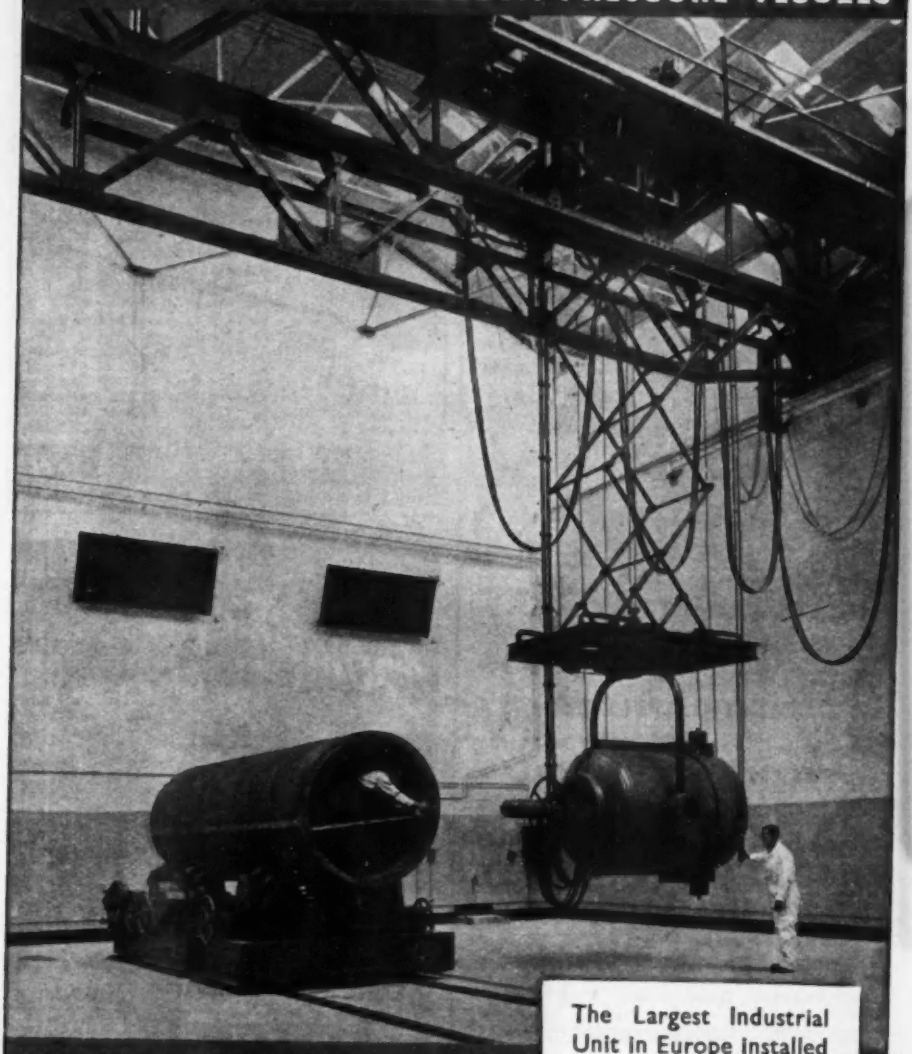

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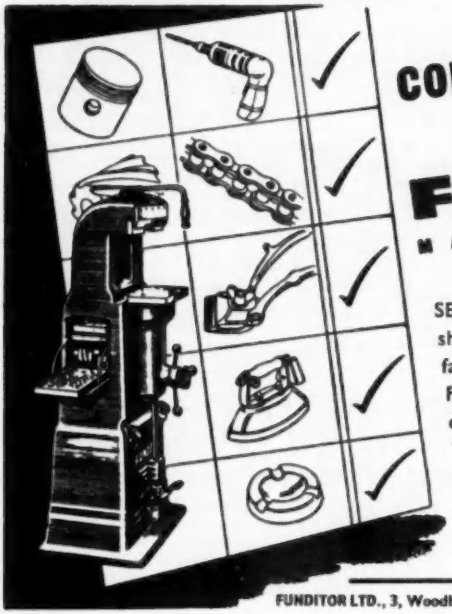

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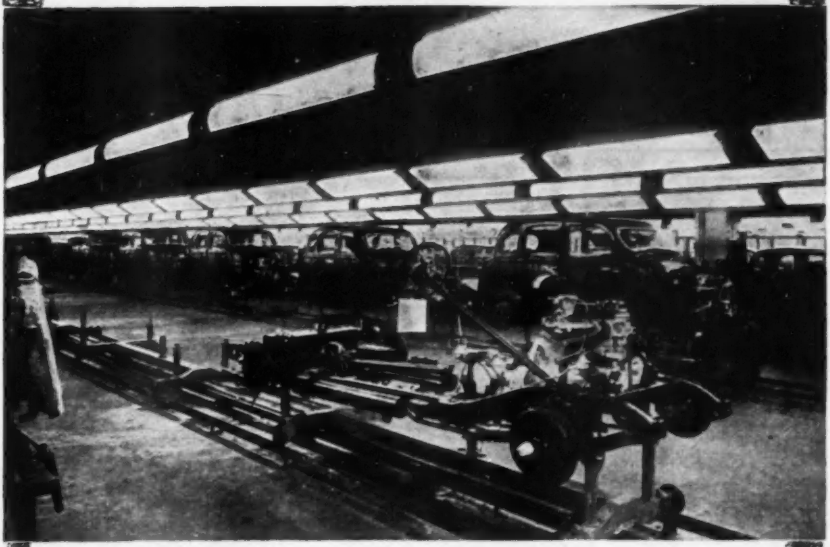

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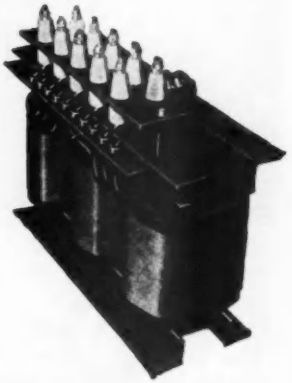

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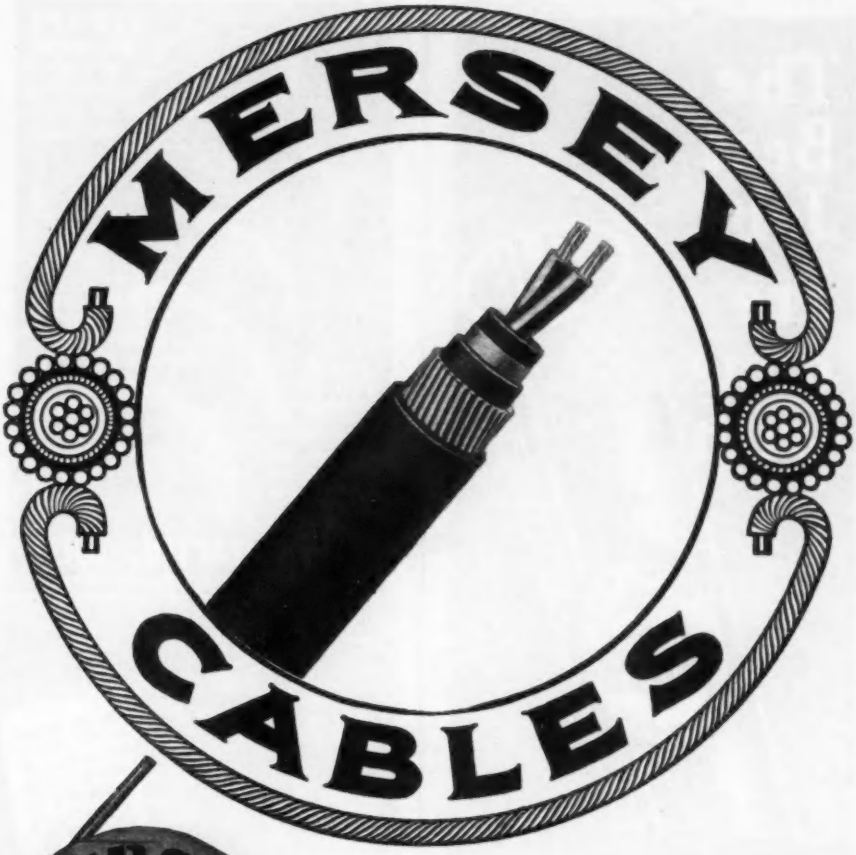

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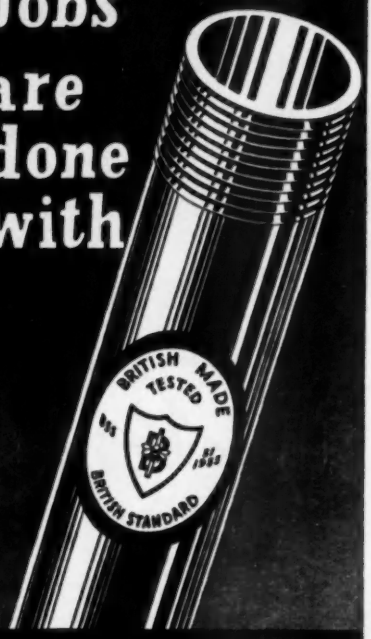


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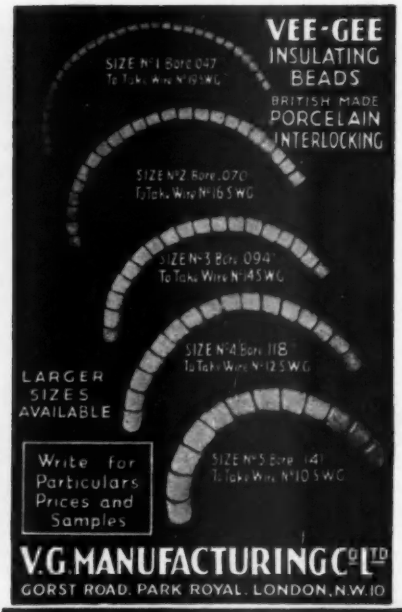


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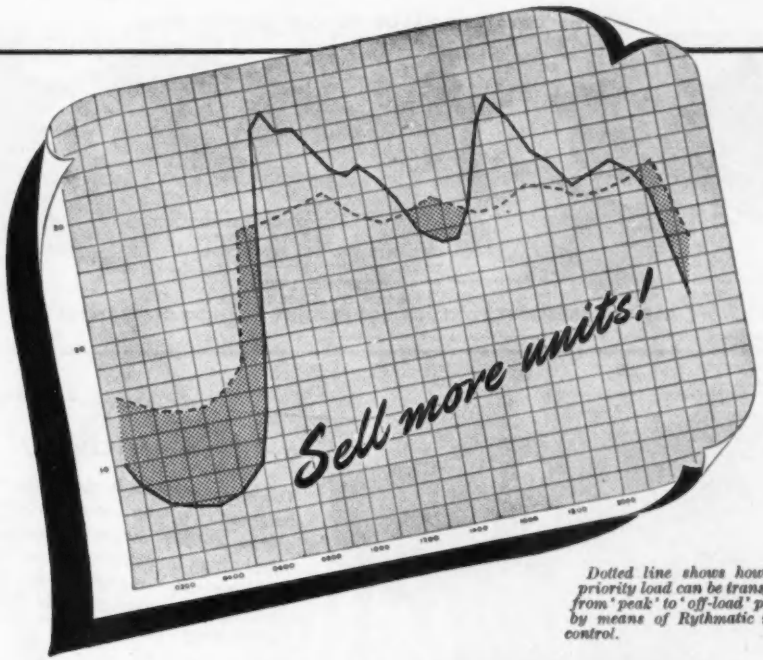


*Dotted line shows how non-priority load can be transferred from 'peak' to 'off-load' periods by means of Rythmatic ripple control.*

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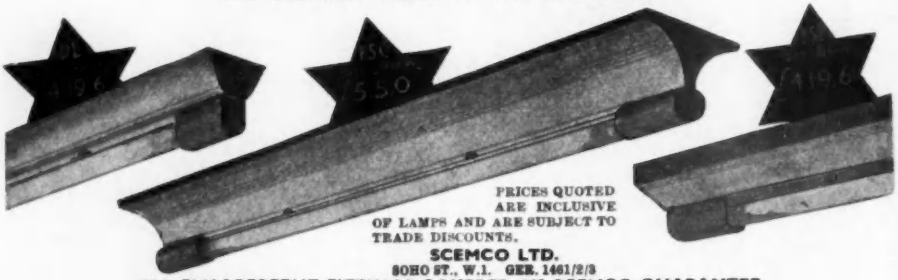


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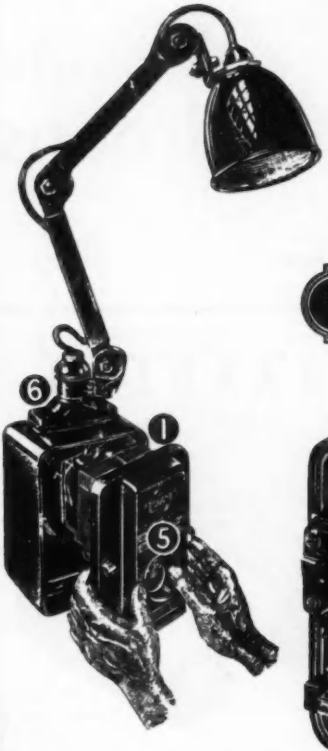


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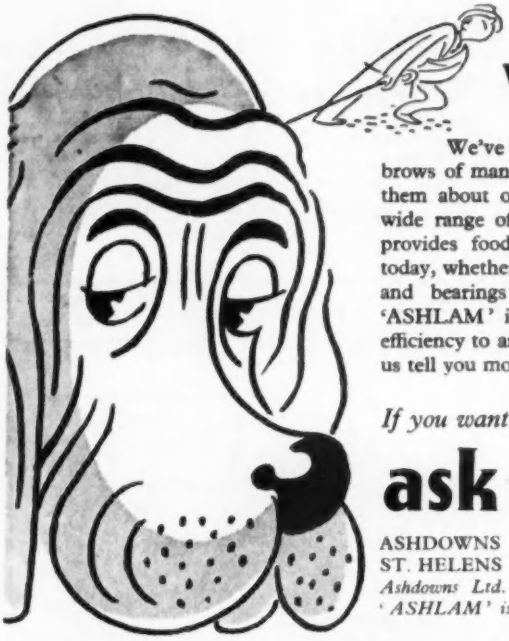

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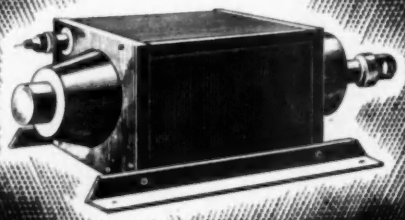

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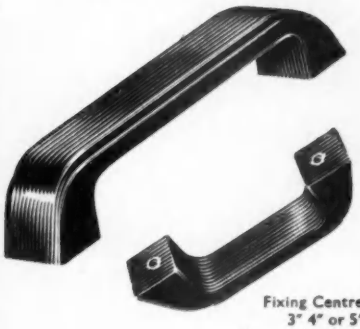

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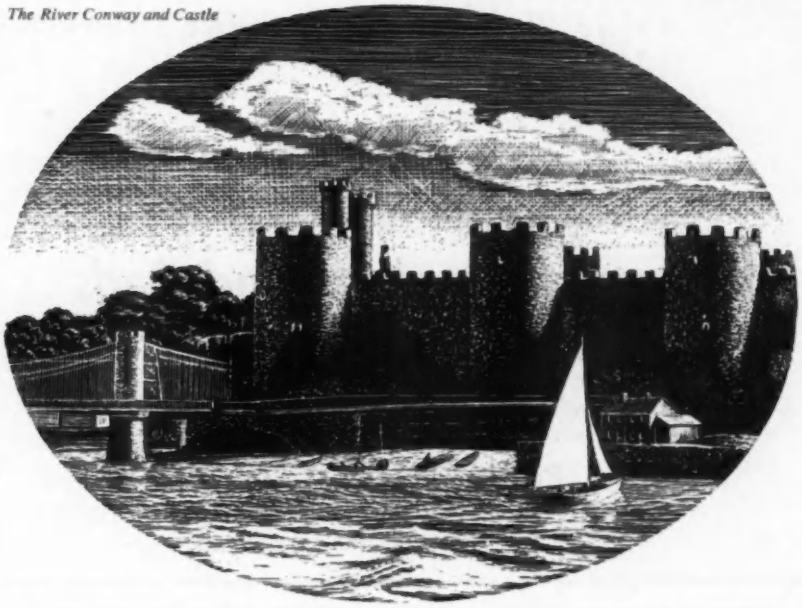

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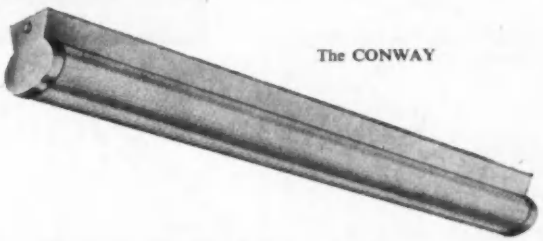

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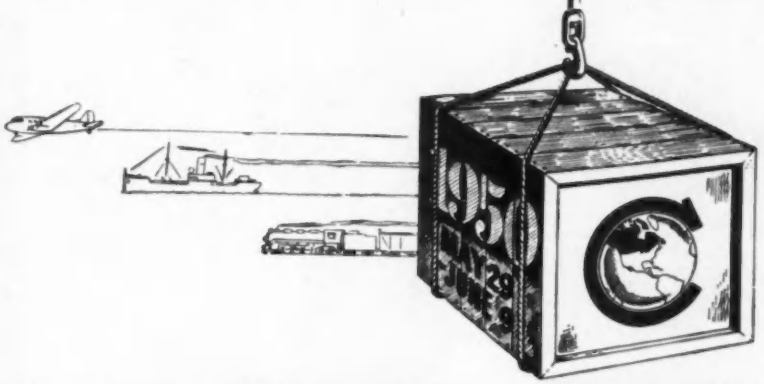


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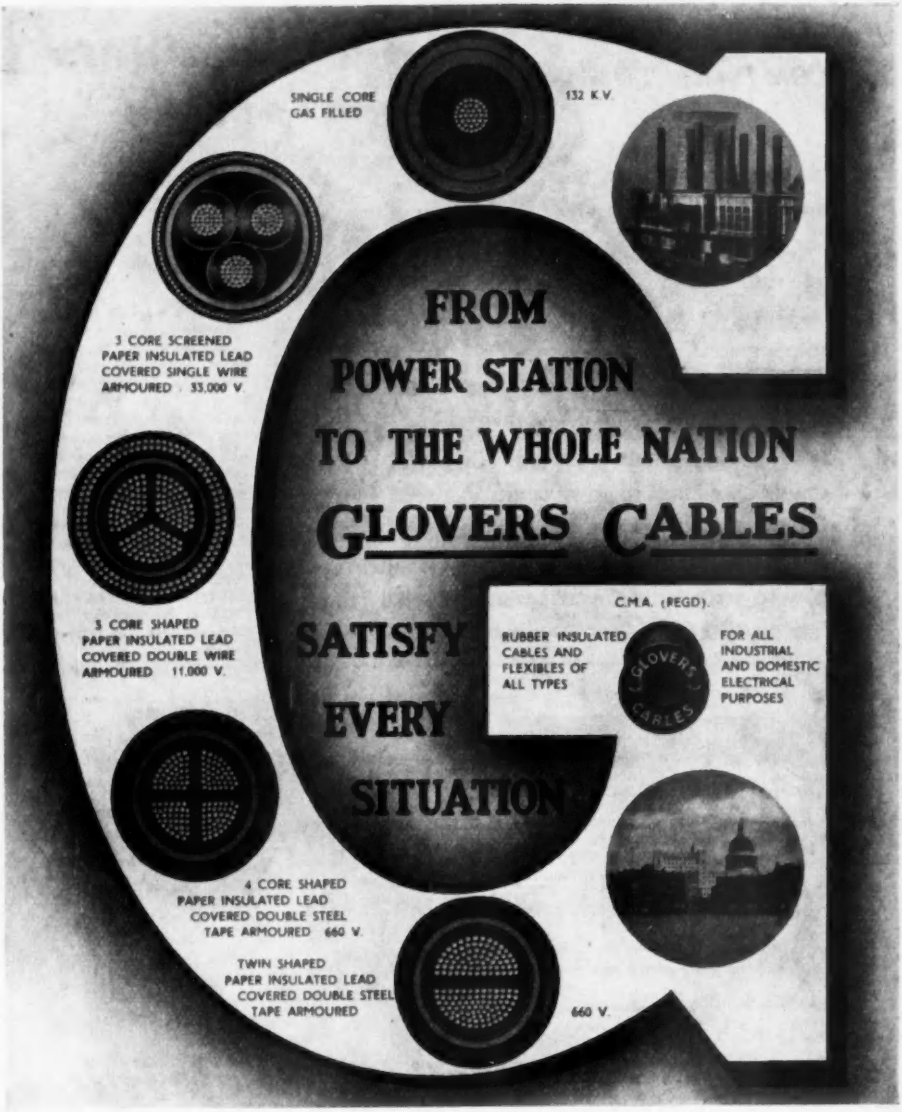


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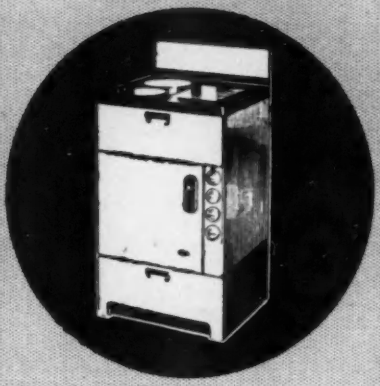

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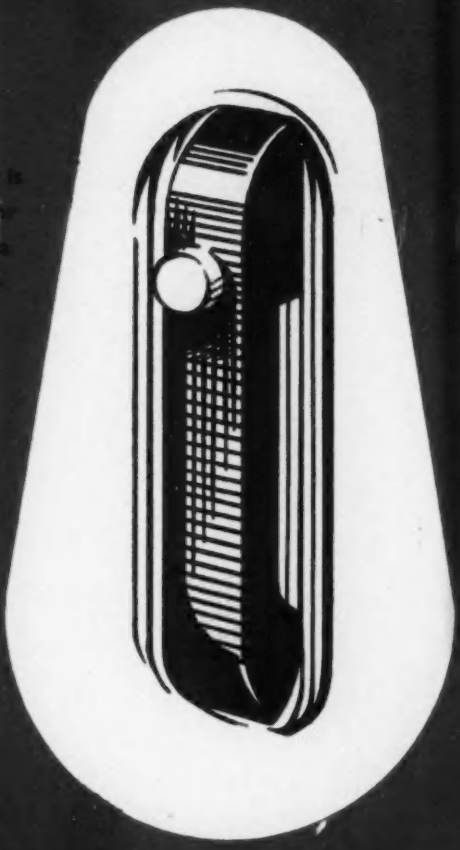

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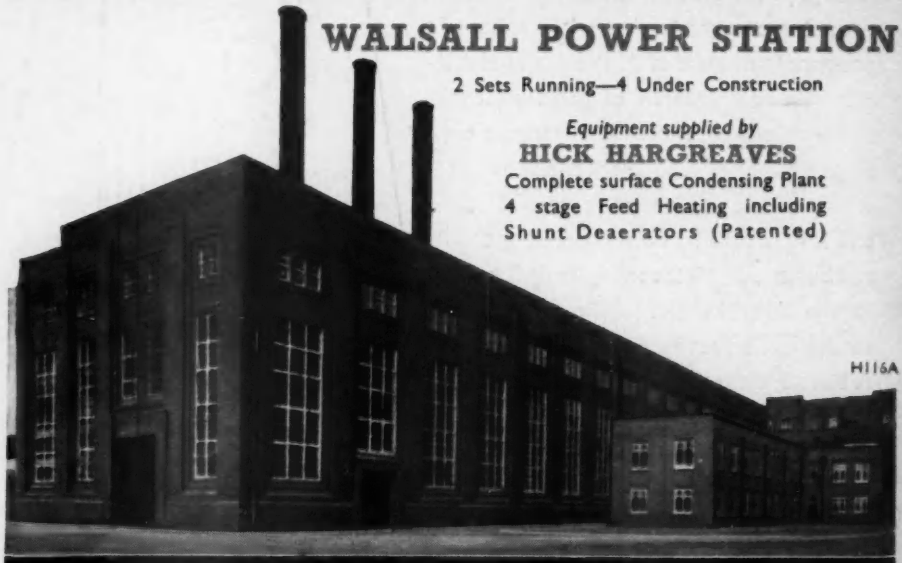

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